Multi-deck Carpark at Brisbane Airport: A Case Study

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Introduction
In its review of the Brisbane Airport masterplan, Brisbane Airport Corporation Limited (BACL) identified the need for a purpose-built long term car park at the domestic terminal. As a result, a multi-deck car park was recently completed. It was built on the site of the existing open car park which remained operational throughout the redevelopment period. The new car park is capable of accommodating 1800 cars under cover.

The project was delivered ahead of time and within budget using a Design and Construction procurement system. The contractor was Barclay Mowlem Construction Limited who won the bid with an innovative alternative solution. The procurement approach adopted by BACL included some innovative steps which are described in the following study.

General Overview of Design & Construct Contracting in the Construction Industry
Under this form of contract, a contractor normally has responsibility for designing and constructing the entire construction contract and is responsible for ensuring that the erected construction complies with certain defined functional requirements. A commercial interest in the project provides incentive for innovation by the contractor. In the bid stage, contractors can use their expertise to establish competitive advantage, and the client can avail themselves of the opportunity for an enhanced outcome.

Some aspects of design and construct contracting are:
- The contractor has responsibility for design, documentation, co-ordination of consultants and so on, as well as for construction.
- The client has an agreement with a single organization for planning, construction, and in some instances for maintenance.
- The number of construction companies with sufficient resources available to realize the project may be fewer than for a traditional lump sum contract. The advantage for eligible contractors is that fewer bidders mean a higher probability of winning the contract.
- Some design and planning of the program/brief is done by the client, but the large part of the detailed planning takes place under the contractor’s responsibility.
- The ability of clients or their agents to write precise briefs is variable. A return brief prepared by the contractor confirming their understanding of the client’s needs and the scope of work, and approved by the client is essential. This helps to ensure the client is aware of cost and production implications of changes to their requirements. Changes made by the client during the design stage can be expensive, as they will affect the whole of the Design and Construct contract, rather than being confined to the design team’s costs.
The contract style demands extensive and ongoing involvement on the part of the client in order to ensure the adequate protection of their interests throughout all stages of the project.

Price factors may force the project focus to be upon achieving the contractor’s financial business needs rather than to fulfilling the client’s requirements.

The system for exchange of knowledge is created by the contractor and not by the client.

The construction phase can start earlier than with a traditional process.

The intensified time schedule requires documentation for several different aspects of the building to be completed simultaneously. Theoretically, this strategy lowers planning costs by shortening design and planning time. In reality this practice often results in planners and designers working under pressure to produce the documentation quickly and increases risk of mistakes during the intensive planning stage. Planning and design is scheduled and implemented to meet the order of production rather than the order which is most logical to design and document.

Multi-deck Car Park Project Overview

Scope of work
The main components of the scope of work of the project were the construction of a long stay car park, an office for the car park operator, a pedestrian bridge over the busy access road to the airport terminal and covered walkways through the short term car park to the domestic terminal.

The BACL originally planned to provide 1500 undercover parking spaces over 5 levels including 300 spaces at ground level. The brief included full utilisation of the available site area with long term parking to remain operational during the construction phase. The pre-tender cost estimate was in the order of $12,900,000.

Contract conditions
Following a staged tender process, the BACL entered a Design and Construct contract with Barclay Mowlem Construction Limited with purpose-drafted conditions. The contract included a Guaranteed Maximum Price with shared savings.

Project as built
The car park that was procured as a result of an innovative solution on the part of the D&C contractor provided more overall spaces than originally planned and more of those under cover. As well as some exterior parking, the car park structure includes parking at ground level plus two suspended floors, the top level being fully roofed. Footings and columns were designed and built to be capable of carrying an additional two floors in the future.
The car park was built in two stages, with progressive hand over of completed areas, allowing the long term car park to remain operational throughout the construction phase. The final construction cost was $12,165,000. BACL utilised their share of the savings achieved by the D&C contractor to install extra features such as a closed circuit television security system and a facility for Optus communications.

**Client business needs**

The need for a purpose-designed long term parking facility at the Brisbane Airport was identified by BACL in a review of the airport masterplan. Various development factors impacted on the project. BACL sought to optimise both the site planning strategy and the visual impact of a large scale car park on the airport development.

**Big Picture**

In the long term, a new runway parallel to the existing is planned in expectation of an increasing volume of air traffic through Brisbane Airport. The location of the multi-deck car park was viewed as an integral part of a future airport plaza located between the runways.

**Timing**

In the short term, other developments were taking place at the Brisbane Airport. The airport rail link project was proceeding and a hotel to be located on the site of the existing short term car park was due to go ahead. The increased parking capacity to be provided by the proposed long-term car park was to be utilised for short-term parking during the construction of the hotel. Therefore it was critical to complete ‘stage 1’ of the new multi-deck car park prior to the commencement of the hotel construction, and in time for the Sydney Olympics in September 2000. The whole car park was due for completion in January 2001.

**Market Share**

Another factor which impacted on the decision to develop a multi-deck car park was BACL’s identification of the market demand for long term under cover parking. Parking generates a substantial percentage of revenue for BACL and they aimed to increase their market share. BACL recognized that in order to meet the changing demands of airport users, the quality of the facility was a significant consideration.

**Qualities and design parameters**

BACL’s aim was to provide a “great carpark” that end users would experience as hassle-free. BACL recognized that protection against one of Queensland’s more adverse climatic conditions, the hail storm, which can wreak substantial damage to motor vehicles, was an important selling point for their customers. To this end they sought provision of parking under cover as a priority requirement to protect against hail damage. Sun protection for customers loading and unloading their vehicles was also a valuable quality.

BACL required a clearance of 2400mm head height throughout the car park. This is marginally higher than some similar projects. One reason for this strategy was to ensure compliance with the Disability Discrimination Act which is performance based rather than prescriptive. This is a reasonable head height which allows access to a four-wheel-drive vehicle with a wheelchair on top. Parking bay sizes and aisle...
widths were specified to be optimum size rather than the minimum required by the code.

Movement patterns throughout the car park were required to be clear cut and free flowing. The traffic plan was required to allow reasonably quick exits at peak times and to be capable of handling short term parking parameters. Another requirement from BACL was for the car park to be non-sprinklered and naturally ventilated.

Overall, BACL sought a durable technical solution to the problem of providing large scale parking.

**Development Approval**

BACL leases the airport parcel of land from the Commonwealth Department of Transport and Regional Services who are also the regulatory authority for major developments on the site. Currently any projects valued $10 million or over require development approval. Preparation of a Major Development Plan (MDP) is required for assessment.

Once the BACL Board made the decision to go ahead with the project in September 1999, it was necessary to prepare the development application immediately. The Commonwealth is required to provide a response to an MDP within 90 days of an application.

During preparation of the Major Development Plan, BACL performed an environmental impact study, undertook public consultation and developed an environmental management plan. The MDP included outline plans and sketches of the proposed car park. These were prepared in-house and indicated a 5-storey structure in a central position on the site. Approval was gained and BACL pursued procurement of the project.

**Choice of procurement approach**

**Client team structure**

Nicholas Forbes, Landside Transport Commercial Manager for BACL initiated the project and was authorised to represent BACL on all matters relating to the project. He selected specialist consultants to assist him in the technical aspects of the project. Each of these had an established relationship with BACL. These included an in-house engineer to provide technical liaison and hands-on knowledge of airport operations, and a professional project manager skilled in handling all management aspects of the design, contracting and construction. Together with Nicholas Forbes, they made up a client executive team of three for the project. The client also engaged a specialist traffic engineer.

The client team developed a project delivery plan which aimed to take advantage of the opportunities for innovation offered by procurement of the building by a Design and Construct route. BACL called expressions of interest from contractors by advertising in the national press, and at the same time they initiated a process to establish the project brief and program to meet the Client Business Needs.
Innovation in the tender process

Concept design
The client team launched an architectural ideas competition as a vehicle to develop the conceptual design for the car park. This strategy was used to establish project parameters such as form, scale, aesthetics, layout and sequential development.

The preferred architectural strategy addressed the design of the main facades and the circulation pods in an effort to mitigate the visual impact of a potentially massive structure. The concept scheme incorporated a translucent screen which would produce a shimmering effect on the main facades. The suspended floors were conceived as ‘floating’ planes. Project definition through the concept design process also included the ‘footprint’ of the proposed building.

It was originally intended that the architects commissioned as concept designers would be novated to the contractor. However, during the process the client team perceived that this scenario had the potential to hamper tenderers’ potential for lateral thinking.

Contractor selection process
A large number of expressions of interest from contractors were received in response to the original advertisement. In the second round, a briefing paper was provided to a selected number of potential contractors. In the third round these responses were analysed and short-listed separately by each of the members of the executive team using pre-determined and weighted selection criteria such as capacity, capability, experience, financial soundness, expertise in car park projects, litigation background, and so on. Ten tenderers were selected by this process. The client team then conferred at length to narrow the short list from ten to five.

Once the team members had agreed on the short list, they conducted interviews with each of the potential contractors prior to confirming the tender list.

Avenue for Non-conforming submissions
First and foremost, tenderers were required to submit conforming tenders and the client was under obligation to consider all conforming tenders. However, the client team sought to encourage lateral thinking and expressly created the right of tenderers to submit alternative tenders. A policy was formulated and documented in relation to non-conforming bids and included in the invitation documentation. This included scope and criteria for evaluating non-conforming bids. The client team ensured that contract award criteria were established in advance and known to all parties thus creating a transparent award process.

Progress meetings
The client team instigated a requirement to monitor tenderers’ designs as they developed during the tendering period. To this end individual tenderers were obliged to meet with the client team twice during the tender period to discuss their approach to problem definition and solutions. Understandably, all parties were concerned about procedural integrity. Contractors sought assurance that probity objectives would be met, ensuring fair and equal treatment to all tenderers.
The client team from their end “worked very hard” to make sure proceedings of meetings remained confidential. Information from this process was restricted to the three executive team members who gave an undertaking to contractors not to “cross-fertilise” ideas from one tenderer to another.

After a cautious start, contractors perceived a high level of integrity and ethics at work on the part of the client team, and embraced the process as they saw opportunities for establishing competitive advantage. A positive spin-off from the approach was that the proponents were able to establish a working relationship with the client early in the procurement process.

**Life cycle warranties**
The client charged tenderers with achieving a design which could meet a 40 year life expectancy. They were obliged to carry out rigorous life cycle cost analyses in order to provide warranties for 40 years. Construction costs and maintenance implications were assessed concurrently. For example, concrete was selected for the superstructure over structural steel as it was both economical and more suited to a potentially salt-laden environment over time.

In another example of the benefit of this approach, the client’s conceptual design included custom designed façade components which proved to carry a cost penalty both in construction and for long-term maintenance. The winning tenderer’s design team achieved the desired effect through the innovative use of more standardised components at a lower cost.

The requirement for warranties was viewed positively by tenderers. The industry perceives that some clients are only interested in up-front costs and a quick return. Builders seeking longevity in the industry are keen to be associated with durability and a higher standard of work. The BACL client was obviously interested in reducing long term operating and maintenance costs and sought to put in the necessary groundwork in the early stages of the project.

**Development of Alternative Design Submission**
Barclay Mowlem’s winning submission exceeded BACL’s initial expectations of what could be achieved for the budget and within the time frame. Initially, Barclay Mowlem considered that the client had entrenched ideas regarding the form, scale and footprint of the building. They were able to identify an alternative approach to providing maximum undercover car parks while fulfilling the client’s business needs pertaining to timing and continuous operation.

The alternative design concept reduced the height of the car park from 5 levels to 3 and reconfigured the plan to enable the project to be built in two stages. The footprint was increased, as was the car park’s capacity. The reduction in height lead to an overall saving. The two stage approach was a relatively simple solution to maintaining an operating car park throughout the construction phase.

Barclay Mowlem’s submission also included the option of upgrading the superstructure to allow future vertical expansion of the car park.
The concept, including the option to increase the superstructure, was adopted by the client who recognised the obvious advantage of providing more car parking for less than the pre-tender cost estimate.

BACL discussed the implications of the alternative design for the MDP with the Department of Transport and Regional Services. The design was approved and the project proceeded.

**Communications, quality of relationships and contractual interfaces**
Both client and contractor teams put effort into developing a positive attitude amongst the whole team.

As part of their tender preparation, Barclay Mowlem Construction Limited chose not to shop around for consultants, rather selecting them on pre-qualification criteria. The designers were Daniels Anderson Architects who have an established reputation in shopping centre design including large scale car parks. Car park planning constitutes an integral part of their core business. Robert Bird and Partners were the structural engineers, a proven supplier having a successful track record of working with Barclay Mowlem Construction Limited. Sub-contractors were similarly appointed. Fee levels for consultants reflected or were above market rates being achieved at the time.

Relationships amongst the contractor’s project team were reported to be excellent. Paul Nunn from Daniels Anderson Architects explained that:

“All team members were experienced in this type of project and procurement method. Their opinions were respected and combined with a well-defined organizational hierarchy, there were no conflicts.”

Throughout the contract phase the client had confidence in the Barclay Mowlem team. Previous experience on the contractor team and the level of commitment and dedication brought to the project was highly valued by the client. As a result, a high level of trust existed between client and contractor.

The individuals interviewed considered that continuity of team members for the life of the project was very important to the overall success of the project and agreed that the project team were very proactive in seeking better solutions for better outcomes.

**Outcomes**
The client organization registered an extremely high level of satisfaction with the project outcome. Overall time, cost and quality objectives were met with a well-designed building which delivered value for money to the client. The multi-deck car park was delivered several weeks ahead of time in an eight month program. The client was able to use their share of the savings achieved to install $400,000 worth of extras including a telecommunications room for Optus mobile phone network and Closed Circuit TV security monitored throughout airport. The contractor also
suggested further savings in operating costs through installation of a system to monitor and control power consumption.

The contractor achieved an above average level of satisfaction with the project because the objectives of the client were matched or exceeded, remuneration was achieved at an appropriate level, and the building which resulted from the process displays both architectural qualities and a high standard of work.

Overall, those involved with the project believe teamwork and a non-adversarial approach contributed significantly to the success of the project.

All members of the project team interviewed believe that end users of the car park would also perceive a high level of satisfaction as the project delivers a combination of functionality, utility and quality.

**Conclusion**
This project demonstrates the validity of an alternative delivery system. In this case, the client lay the groundwork for innovation by including allowance for non-conforming tenders and the contractor responded with a design solution which created a high level of added value to the client.

The strategy adopted by the client team included confidential meetings with tenderers during the tender period. The success of this approach depended almost entirely on the client team’s level of ethics and ability to establish mutual trust between themselves and the tenderers’ teams. The client team successfully established a process to determine an appropriate balance of innovation and control in design and to communicate the desired balance to potential design-and-build tenderers.
PROCESS DIAGRAM
Multi-deck Car Park, Brisbane Airport

IDEAS COMPETITION
ARCHITECT 1
ARCHITECT 2
ARCHITECT 3

CONCEPT DESIGN

CONFORMING BID
NON CONFORMING BID

CONTRACTOR TEAM 1
CONTRACTOR TEAM 2
CONTRACTOR TEAM 3
CONTRACTOR TEAM 4
CONTRACTOR TEAM 5

PROJECT INITIATION
MAJOR DEVELOPMENT PLAN APPLICATION
D.O.T. APPROVAL

DEVELOPMENT OF BRIEF
EOI FROM D & C CONTRACTORS
- Shortlist
- Briefing Document
- Final shortlist - 5

TENDER PERIOD
Review meetings between client and tenderers

EVALUATION OF BIDS against published selection criteria

NON-CONFORMING TENDER ACCEPTED
- More cars
- Lower price
- Faster time
- Staged completion

DESIGN AND CONSTRUCTION PHASE

OUTCOMES
- Early completion
- Shared savings
- Satisfied client
Appendix B

Comparison with previous studies.
The T40 Study and Mohamed and Yates’ CSIRO report on construction re-engineering identified the attributes which are needed to make the quantum change to reengineered process. The comparison between these case studies and the BACL long term car park project is summarized in the following tables:

T40 (Ireland 1994)

<table>
<thead>
<tr>
<th>Success factors</th>
<th>Comment on applicability to BACL Carpark process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreed common goals</td>
<td>Client and contractor understood and supported each other’s objectives.</td>
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<tr>
<td>Simplified process</td>
<td>Contractor established a single point of accountability and worked closely with client.</td>
</tr>
<tr>
<td>Re-engineered activities</td>
<td>Procurement process was innovative, included allowance for non-conforming tenders.</td>
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<tr>
<td>Workforce commitment</td>
<td>All parties including consultants and subcontractors were very highly committed to project.</td>
</tr>
<tr>
<td>Partnering with local government</td>
<td>Local government input not required. Client liaised with Federal Government at the earliest stage possible. Changes in design at tender stage were resolved prior to start of construction</td>
</tr>
<tr>
<td>Tendering on benchmarking</td>
<td>Tenders selected on the basis of pre-qualification. However, tendering process required considerable expenditure of effort by several contractors.</td>
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</tbody>
</table>

CSIRO (Mohamed and Yates 1995)

<table>
<thead>
<tr>
<th>Success factors</th>
<th>Comment on applicability to BACL carpark process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong commitment by the team to improving design and construction workflow</td>
<td>All project team members including client team were highly committed to project development, resolution and completion</td>
</tr>
<tr>
<td>Effective communications between major project participants</td>
<td>Communication between contractor and client excellent throughout the design and construct process</td>
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<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. Contractor delivered with design solution.</td>
</tr>
<tr>
<td>Improved construction output</td>
<td>Project completed ahead of time. Client’s staging requirements satisfied.</td>
</tr>
</tbody>
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References
