
Cover photograph of the Museum of Tropical Queensland by Glenn Bourner.
RE-ENGINEERING THE CONSTRUCTION DELIVERY PROCESS

The Museum of Tropical Queensland, Townsville. A Case Study.

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ABSTRACT: The recently constructed Museum of Tropical Queensland in Townsville is reviewed as a case study in research into re-engineering the construction delivery process. The project involved an innovative approach to the procurement of a public building and resulted in a highly successful outcome. Several key areas which were identified as contributing to the success of this project need to be investigated further to establish their role in contributing to the success of other construction industry projects.

Keywords: Procurement, project delivery methods, construction re-engineering.

INTRODUCTION

The construction delivery process refers to the method of organizing the production of the project including the design, documentation, construction and commissioning of the project, and embodies the risks, returns and responsibilities assigned to the parties (Heldt, Hampson et al 1997). In recent times, public buildings in Queensland have been procured by various systems. All must meet probity requirements and be seen to deliver "value for money" to the community. The project outcome must provide a composite of benefits assessed against various criteria, which, when assessed against cost, may be said to represent value for money.

The issue of value for money is of particular relevance to the procurement of the Museum of Tropical Queensland because assessment of tenders was not based on the "hard dollar" issue of price tendered by each bidder. At the time of selection, the budget was firmly in place and the client sought to put in place a procurement process which would achieve the highest value for the fixed funding allocated to the project by Queensland Treasury.

Initially, it was expected that the proposed facility, which was the second stage of an existing collection-based research and educational museum, would be procured by traditional method managed by Project Services of the Queensland Department of Public works and Housing. However, the client group, a community-based Board, seeking to avoid the potential for contract variations, extension of time claims and budget blowouts, sought a more effective guarantee of value for money than the "traditional" system could deliver.

Strategies for improving the efficiency of the construction industry may include restructuring the systems and procedures which deliver projects so that improved benefits to the end users are provided.
Initially it was expected that the new Museum would be procured by a traditional contracting system in which the Queensland Department of Public Works and Housing would control and co-ordinate the project. However, the Queensland Museum Board sought greater scope for innovation in both the procurement process and in the resulting building by seeking alternatives to the traditional route. The project went through several stages from opportunity identification until the start of construction. The process of developing the brief, developing the approach to the project delivery system, and obtaining bids from contractors is described below.

Background

The Queensland Government approved the development of a North Queensland branch of the Queensland Museum at Townsville in 1984. The approval was for a two stage project. Stage 1 was completed in 1988, with the second stage projected for development in the mid-1990s.

In 1992, a Government Policy Review of the Queensland Museum recommended that Stage 2 of the Museum of Tropical Queensland be completed. As well as housing an internationally important reference collection of corals, Stage 2 was to include collections from and displays depicting the Pandora shipwreck. In reaching a decision on the most appropriate venue to locate the expanded branch, the Queensland Museum Board of Trustees assessed submissions from Townsville, Cairns and Brisbane. In 1995 it was decided to locate the expanded branch in Townsville.

In mid-1996 the Pandora Foundation was established in Townsville and a campaign to raise funds for expeditions to the Pandora wreck site was launched with enthusiastic support from local enterprise. To help advance the excavation and conservation of the remains of the Pandora wreck, the State Government pledged a subsidy of one dollar for every two dollars raised by the Foundation, up to a maximum of $1 million.

At the same time, the Premier of Queensland announced a commitment of $17.5 million funding to the Queensland Museum Board of Trustees for completion of Stage 2 of the Museum of Tropical Queensland. This accorded with the Government’s policy of boosting regional arts infrastructure. That Queensland Treasury allocated funds for capital works directly to a statutory board was itself a radical step.

The 1996/97 State Budget allocated $50,000 to the Museum of Tropical Queensland for preliminary planning purposes. Senior museum staff were assigned to research and develop the brief with local consultants and the Department of Public works and Housing. The project brief which resulted from this collaboration was a valuable document which comprehensively specified the spatial, technical and operational requirements of the expanded museum.
The Project Development Process

Client's Vision: Impetus for seeking an alternative form of delivery

The Queensland Museum is an Arts Queensland statutory authority managed by a community-based Board of Trustees. The Board’s vision for Stage 2 of the Museum of Tropical Queensland was to provide world class curatorial, research and educational facilities in a museum which was also a high quality civic building. Such a facility was also seen to be of benefit to local tourism and enterprise, and in boosting a local sense of identity in the Townsville region.

To achieve their vision it was essential that the Board administer the fixed funding allocation of $17,500,000 in a way that would gain maximum value. The Department of Public Works and Housing had proposed that procurement management, construction supervision and contract administration roles would be performed by their commercial section, Project Services, using a traditional lump sum contract. However, the Board members were not convinced that traditional methods would produce the best result for the Queensland Museum or for the community. The Board also recognized the need to take advantage of industry expertise to capitalize on the extensive design brief that had already been prepared. These factors, as well as the necessity to minimize the level of risk to the Queensland Museum board members, provided the impetus for considering alternative project delivery methods.

To that end, the members of the Queensland Museum Board of Trustees approached an Arts Queensland consultant to present a range of delivery options to them. Subsequently, the Board unanimously agreed to seek Expressions of Interest from the construction industry at large to test the range of options available to them from both the private and public sectors.

Selection process - Expressions of Interest

Through public advertisement in mid-July 1997, the Board invited proposals from interested consortia with demonstrated experience in total project delivery systems for civic projects. The registration of interest document (Qld Museum July 1997) required that the museum remain operational throughout the redevelopment. The completion date was noted as mid-2000, with the facility to be officially opened in September 2000.

The selection criteria for this stage were:

- Consortia composition - the range of expertise on offer, including any value adding aspects. 30%
- Experience and people - nomination of specific team members. 30%
- Extent of involvement of local expertise - seen as an essential element for a successful community building. 25%
- Innovation - demonstrated ability to contribute new methods or approaches to construction projects. 15%

The heavy emphasis on consortia composition and personnel in the first stage of the selection process was a carefully weighed attempt by the Queensland Museum Board to seek out the entities it regarded as most able to deliver value for money. The Board was able to pre-qualify tenderers for the next stage by considering such matters as technical experience and expertise, teamwork and communication skills, current commitments and availability to the project, financial and management resources, claims and disputation record, quality and time record, whether the entity would be flexible, co-operative and trustworthy, industrial relations and safety record and so on.

Some consortia which were not based in Townsville sought to establish partnerships with local counterparts.

Thirteen offers were received from various companies and consortia. Five registrants were subsequently short-listed by the Museum of Tropical Queensland Management Committee.

Bid stage - tender criteria
The short list was announced on 28th July 1997. The tenderers were supplied with the detailed Project Brief and invited to submit a proposal and a design concept for the facility by the 8th September, 1997. The short-listed submissions were evaluated in accordance with the selection criteria as follows:

- Consortium membership and personnel 5%
- Consortium hierarchy 10%
- Project delivery methodology 30%
- Brief Interpretation 5%
- Cost Plan 10%
- Program 10%
- Presentation 30%

The low weighting placed on consortium membership as this stage was based on the candidates having been pre-qualified during the first round. However, the tenderers were required to make a presentation to a panel comprising members of the Board, the Museum of Tropical Queensland Management Committee, and museum staff. As well as giving the consortia the opportunity to sell their respective proposals, this was a further significant step in the client’s process of “getting to know the team”.

These “people” factors together with the proposed method of project delivery were the key to meeting the client’s objectives. Consortia were required to nominate the preferred form of contract and provide a substantial amount of detail to explain fully their proposed project delivery system. They were also required to define their cost management process and indicate their willingness to operate in an “open book” accounting procedure.

The information relating to reporting relationships within the hierarchy was essential to structure a contract between the Queensland Museum Board and the successful consortium. Quality, cost and time factors together made up a further 25%.

Sharing the vision

The submissions received included a range of delivery methodologies including traditional lump sum, and design and construct forms of contract. However, the preferred tenderer was the Leighton Consortium, who demonstrated to the highest level that they understood the needs of the client, the limit of funding, time restraints and operational requirements, and offered a form of delivery which safeguarded the client’s interests. The consortium proposed the Design and Construct form of delivery with a Guaranteed Maximum Price. Overarching the delivery system was alignment of objectives, and evidence of strong relationship management ability.

The Design and Construct delivery system proposed by Leighton Consortium included a Point of Satisfaction, which was devised as a precautionary measure to give either party the opportunity to withdraw once a certain level of design had been achieved and the Fixed Price Contract Sum established. If the Queensland Museum did not wish to continue with the project, the consortium would be reimbursed reasonable costs and cease to work on the project. From the client’s perspective, this offered an excellent opportunity to find out exactly what was being offered, at a sensible level of expenditure, prior to formalising a contract. Leighton Contractors, builders for the consortium, also indicated that they were willing to apply a process of “open book” financial control to the project. Profit margin and consultant fees were declared in the consortium’s tender submission. During their assessment of short listed bids the client body was satisfied that consultants’ fees accorded with industry levels.

The Consortium’s response to the needs of the client was encapsulated in the architectural qualities of their proposed design solution. The consortium identified the need to demolish the existing Stage 1 building, as they recognized that funds could be better utilised on a purpose-built Stage 2 Museum. Beyond the original Design Brief but within the $17.5m budget, the design concept offered an additional 600m² feature gallery and a boardwalk fronting Ross Creek which would give pedestrians public access to the waterfront. A strategic element of the design concept was the dramatic hull-like form of the feature gallery.
This was a reference to the maritime context both within and outside the museum, and served to create a "landmark" identity for the museum building.

Leighton Consortium’s proposal met the requirement for the museum to remain operational throughout the redevelopment period by staging the construction of the new building. Their proposal also included managing the relocation of existing collections and staff to the new facility. This in itself was attractive to the Museum of Tropical Queensland Management Committee as it meant that fragile collections of corals and artifacts would need to be moved only once rather than multiple times.

The project delivery method as proposed by the consortium led by Leighton Contractors was summarised as a form of contract in which the contractor assumed the costs and time responsibility for design, performance of the design team, and construction. Leighton’s proposal gained widespread acceptance amongst the members of the Queensland Museum Board and the Museum of Tropical Queensland Management Committee.

Contractor’s Role in Innovative Project Procurement

Leighton Contractors were proactive in developing a total delivery system to match the Queensland Museum Board’s vision. Recognising that the winning tender would essentially be awarded on "soft dollar" criteria rather than cost as the budget limit was tied to fixed funding allocation, Leighton Contractors established a project team at the Expression of Interest stage which could offer collectively and individually proven expertise in all disciplines ranging from architecture and engineering to interactive display technology, development management and life cycle performance.

The Leighton Consortium did extensive research in the earliest phases of the project, identified the Queensland Museum Board’s key objectives, and focused the design effort upon achieving these objectives. At the same time the project team identified the Board’s key risks as cost, community support and optimal design, and focused process efforts on managing these risks.

Leighton Contractors’ approach to managing Client risks included the following strategies. Costs were controlled through a policy of no variations and design was optimized to ensure the museum could incorporate technical advances to benefit future displays. Community support for the project was encouraged through a public relations program of conducting open days, guided tours and functions throughout all project stages.

The Delivery Model

The delivery system model proposed by Leighton Consortium allowed the client to be involved and fully contribute to the project within their areas of expertise, to allow flexibility within the design process and to ensure that time and cost requirements were met. It was neither a classical design and construct nor management model. It contained three distinct phases and each phase was triggered by an approval to proceed from the client.

Firstly, during the Preferred Consortium phase, the cornerstones for the entire project were put in place – consultation, finalisation of the functional brief, local authority approvals, design and the cost plan. At the end of this phase, the conditions of contract, the fixed price contract sum, and the design were agreed and "approval to proceed" given by the Queensland Museum Board.

The Point of Satisfaction was achieved on receipt of this approval and the second phase commenced. The building contract was formalized at this stage. It contained purpose-written conditions based on standard Design and Construct contracts, negotiated over a number of meetings and endorsed by Crown Law and Queensland Treasury. Design development continued and construction documentation commenced.

The Construction phase included progressive approval of the documentation as the project proceeded through the stages of structure, fitout, display installation and occupation.
Extensive and ongoing involvement on the part of the client was both demanded and welcomed throughout the process as the “team” as a whole were committed to achieving a successful outcome.

In another departure from the normal D & C contract, only one design solution was sought. Usually a number of bids from architects are sought by the contractor and evaluated in terms of the building solution. In this case, the contractor sought the services of a high-profile award-winning design firm to underpin their original submission to the QMB.

OUTCOMES

The Museum of Tropical Queensland was completed five months ahead of the original schedule. The client’s cost and quality objectives were achieved and since opening in 2000, the facility has won community support and acceptance.

Both the client organization and the design and construction consortium identified the following key contributors to the project’s success:

- The well-prepared brief was a critical document and remained a strong point of reference throughout the delivery process. Clearly-articulated client needs lead to cost and time savings.
- A high level of trust and co-operation existed between the partners to the contract. Client and contractor consortium saw themselves as members of the one team with mutual objectives.
- Open lines of communication between the partners ensured there were “no surprises”.
- The considered architectural solution delivered strategic value-added benefits which were beyond the client’s initial expectations.

The fundamental advantages of the delivery process used throughout this project were:

- The fixed budget allowed tenderers to compete on design quality and skilful management rather than price. The Leighton Consortium counted on the design skills of their architect to deliver a solution which satisfied and added value to the client’s brief.
- The point of satisfaction strategy introduced by the successful tenderer allowed the client to obtain a suitable outline design prior to formally assigning documentation and construction risk to the builder. This was essentially a go/no go decision point.
- The builder clearly understood the scope and nature of the necessary building works prior to agreeing to a Fixed Price Contract Sum.
- The open book financial system, where the contractor’s profit margin is known at the outset, encouraged the builder to take on the spirit of the project rather than to try to “do even better”.
- Disputes, contractual or industrial, did not arise.
- Project team participants were selected on the basis of factors other than price.
- The client and the community benefited from the design management skills of the preferred consortium in terms of the end product.
- Recognition of risk share and project constraints - allocation of appropriate risks.
1996 – "PANDORA" FOUNDATION ESTABLISHED IN TOWNSVILLE
Community support for archaeological expedition and museum

DEPARTMENT OF PUBLIC WORKS & HOUSING

1988 - STAGE 1 OF MTQ

1992 STATE GOVT. POLICY REVIEW
RECOMMENDATION TO COMPLETE
STAGE 2 MTQ

DETAILED BRIEF DEVELOPMENT BY:
QM & MTQ STAFF
DPWH, PROJECT SERVICES
CONSULTANTS

TRADITIONAL LUMP SUM ROUTE

QM BOARD SOUGHT ALTERNATIVES,
CALLED EOI FOR TOTAL PROJECT
DELIVERY SYSTEMS

EOI 13 REGISTRATIONS
SHORTLISTING
FORMAL BIDS

BIDS EVALUATED AGAINST
PUBLISHED CRITERIA

LEIGHTON'S CONSORTIUM
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ACCEPTANCE OF LEIGHTON'S BID

PREFERRED CONSORTIUM PHASE

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TREASURY ALLOCATION AFTER
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QUEENSLAND MUSEUM BOARD

QLD TREASURY ALLOCATED
$17.5M TO QM BOARD

Figure 3. Process Diagram for Museum of Tropical Queensland project development
As outlined previously in this paper, the T40 Study and Mohamed and Yates’ report (1995) on construction re-engineering identified key attributes which are needed to make the quantum change to a re-engineered process. This case study has illustrated a trial of some of these issues, for example, the client and the team went to great lengths to ensure that there were agreed common goals, strong commitment by the team, effective communications and positive involvement by the customer. The comparison between this and previous case studies is summarized in the following tables:

### T40 (Ireland 1994)

<table>
<thead>
<tr>
<th>Success factors</th>
<th>Comment on applicability to MTQ process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreed common goals</td>
<td>Client and Contractor consortium understood and supported each other’s objectives.</td>
</tr>
<tr>
<td>Simplified process</td>
<td>Consortium 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 a Point of Satisfaction phase.</td>
</tr>
<tr>
<td>Workforce commitment</td>
<td>All parties including consultants and subcontractors very highly committed to project.</td>
</tr>
<tr>
<td>Partnering with local government</td>
<td>Consortium liaised the local authorities at the earliest stage possible.</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 consortia.</td>
</tr>
</tbody>
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Table 2: Project success factors identified by T40 project applied to MTQ process

### Re-engineering Report (Mohamed and Yates 1995)

<table>
<thead>
<tr>
<th>Success factors</th>
<th>Comment on applicability to MTQ process</th>
</tr>
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<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>Communication between consortium leader and client excellent throughout the design and construct process</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 sought innovation. Consortium delivered with design solution and delivery system.</td>
</tr>
<tr>
<td>Improved construction output</td>
<td>Project completed five months ahead of time.</td>
</tr>
</tbody>
</table>

Table 3: Project success factors identified by Mohamed and Yates applied to MTQ Process
The delivery method adopted for the Museum of Tropical Queensland resulted in a process which enabled the client to make reasoned and accurately costed decisions throughout the project. The case study showed a degree of innovation in the attempt to achieve the best possible outcome for all stakeholders in the project.

One of the critical issues of re-engineered activities identified by Ireland (1994) where the trades are re-organised into a smaller number of groups was not closely tested in the course of this case study as the research concentrated on the front end processes. However, anecdotal evidence suggests that some aspects of design management resulted in a less than ideal outcome for some members of the project team in terms of the amount of time spent on re-work. Part of the problem may have been that design processes were managed in Brisbane, remote from the day-to-day activities on the construction site in northern Queensland.

CONCLUSION

The very simple but effective difference between the delivery method adopted for the construction of the Museum of Tropical Queensland and other Design and Construct contracts is the fact that the cost was set, and declared by the client, prior to expressions of interest being called. Tenderers were competing on non-price criteria which meant that the winning tender would represent the best value for money.

Many Design and Construct contracts are cost-driven and the tender sum is usually based on a concept design drawn at small scale where every item is not detailed and it is not possible to accurately cost all items. This lack of certainty has traditionally confounded Design and Construct contracts as it presents scope for contractors to take opportunities to exploit the process. Under this situation client’s interests may not be adequately safeguarded. This scenario cannot occur when a detailed briefing document is supplied by the client and a return brief is provided by the contractor as was the case in the Museum of Tropical Queensland project.

The smooth running of Design and Construct type contracts may also be adversely affected by a lack of understanding of roles and responsibilities on the part of the client. Some clients erroneously believe that a Design and Construct allows them to alter the scope of work, or the design, without incurring additional costs or without administering a cross-savings system. If the process is not managed to control variations, the process breaks down, opening the way for conflict and dissatisfaction between the parties.

Again, in the case of the Museum of Tropical Queensland, this scenario did not occur because both the client and the contractor consortium were well aware that the contract was a commercial system in which the contractor was acting in a contractual capacity with a commercial interest in the project.

This project demonstrates the validity of an alternative delivery method and illustrates how a co-operative and trusting approach to project development adds to project success. Through proactively seeking positive alternatives, the client was able to take advantage of the expertise of the best proponents in the industry. As a result, the procurement method produced a high value public building.

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