# Reframing the Dynamics: A Case Study of the Interaction between Architectural Computing and Relationship-Based Procurement at the National Museum of Australia.

A thesis submitted in fulfilment of the requirements
for the degree of Doctor of Philosophy.

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# Abstract

The National Museum of Australia (NMA) (1997-2001) by architects Ashton Raggatt McDougall (ARM) in association with Robert Peck von Hartel Trethowan was commissioned by the Australian Commonwealth Government for the Centenary of Federation in 2001. It was conceived as a gift to the people of Australia and now stands on Acton Peninsula in Canberra, the nation's Capital. It is a visually complex manifestation of the design architects' (ARM) dialogue with the ambiguities of Australian history and national identity. The architectural realisation of these complexities was facilitated through advances in computer technologies and a complementary non-traditional procurement method, both at the leading edge of Australian architectural practice of the time.

Completed three years earlier was probably the most debated work of architecture of the 1990s, the Guggenheim Museum (GMB) (1991-98) in Bilbao, Spain, by Frank O. Gehry and Associates (FOG&A). This satellite museum of the Guggenheim Foundation of New York was heralded as the quintessential example of a kind of architecture only possible because of advances in computer technologies. Both visually complex museums were conceived as flagship projects and consequently share many political, functional, and cultural expectations. Both were procured outside the usual adversarial designer/builder paradigm of western architecture and featured the innovative use of three-dimensional (CAD) software for design, documentation and analysis.

The NMA project used a government instigated procurement method which was embraced by a group of design and construction companies who formed a joint venture known as the Acton Peninsula Alliance. This non-traditional or relationship-based procurement method required ARM to reassess their approach to generate and disseminate design data and their traditional relationship with other design and construction professionals. As part of this process, ARM were required to devolve some of their design authority to a project delivery team via a Design Integrity Panel and an Independent Quality Panel; both innovations integral to the Acton Peninsula Alliance.

The NMA project reframed many of the enduring professional relationships of Australian architecture and in so doing extended the skill set and expectations of the architects and others to include a more substantial engagement with 3D CAD and a procurement system which was less subject to many of the common impediments inherent in the more traditional processes.

Through a series of interviews with the architects and other stakeholders, a qualitative methodology was used to investigate the NMA as a case study which uses the GMB as an internationally recognised comparison. This thesis examines how these two projects have been successfully completed within time and budgetary constraints in an environment where flagship projects have had a history of highly publicised difficulties. It reveals that the successful realisation of the NMA was due to the relationships built or reframed as a result of this cooperative approach in conjunction with high levels of engagement with computer technologies. This is in contrast to the seamless flow of data and high levels of prefabrication integral to the success of the GMB.

# Declaration

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made. I give my consent to this copy of my thesis, when deposited in the university library, being made available for loan and copy.

_____

John Paul Swift 18 August 2006
Adelaide

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# Dedications

*To Melinda, Laura and James*

# Preface

Having witnessed the many diverse ways that computers in architecture were being employed in both education and practice, it became increasingly evident to me that there was a discrepancy between their intended use and their application. Hence, my interest in the subject of this thesis was originally stimulated by this divergence. During the very early stages of my research it became apparent that there were many factors outside that of the user's personal preferences or the design of graphical user interface that played a role in how computers for architectural design and production were applied.

The subtle idiosyncratic differences in the approaches of people to the software (as my pre-thesis observations showed) were sometimes due to a lack of understanding or an unwillingness to engage with the software as more than simply an *electronic pencil*. In short, software was used to emulate manual drafting and not to explore the advanced functionalities that were available but were not seen or understood as relevant to architecture. At the same time as my early observations, Computer Aided Design (CAD) in the aviation, automotive, naval and manufacturing industries were having major industry changing effects on form making and the speed and automation of production. It seemed difficult to reconcile the use of CAD in architecture with its use in other design/production professions without a better understanding of what other factors influence this divergence.

My research would show that the pragmatic approach of the Architectural Engineering and Construction (AEC) sector would prove to be a substantial influence on the use of CAD and other computer technologies. As a result, my interest was refocused to the use of architectural computing for more than basic 2D drawings and 3D visualisations; the two most dominant uses in architecture. This new direction meant that the research became increasingly concerned with how people relate through the technical, personal and professional media and how these human and non-human factors complement each other and interact to produce unique, rewarding and successful outcomes.

This thesis which was originally inspired by watching people using computer technologies, evolved through purely technical considerations, and finally returned to questions concerning people's use of computer technology in architecture.