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School of Architecture and
the Built Environment

Thesis

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for Master of Philosophy (Building)

Modification of Standardised Construction Contracts for
the Adoption of Building Information Modelling:
analysing the case of the NSW Government GC21
Construction Contract.

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Statement of Originality

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

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I hereby certify that the work embodied in this thesis contains a published paper/s/scholarly work of which I am a joint author. I have included as part of the thesis a written statement, endorsed by my supervisor, attesting to my contribution to the joint publication/s/scholarly work.
Acknowledgement

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To my long-suffering family, thank you for your ongoing patience for what seems like the un-endless journey that is my path through education.

Finally, to my partner Donna, I fully appreciate your understanding and tolerance of my dedication to completing this dissertation, without your support I doubt I would not have reached the end of my journey.
Abstract

The emergence of Building Information Modelling (BIM) within the Architectural Engineering and Construction (AEC) sector has triggered reconsideration of the procurement process for constructed assets. Although the benefits of its use -- collaboration, productivity gains and improvements to information quality -- are well understood by the BIM community adoption rates within the AEC sector remain low. Various ideas have been advanced to explain this, ranging from high implementation costs, low returns-on-investment, sector-wide risk aversion and low innovation uptake, through to the legal implications of implementation within current contractual frameworks.

This research addresses the last of these by first identifying, and then mapping BIM-related legal and contractual concerns against a widely used standard form of construction contract to determine what changes are required to facilitate BIM integration within the construction procurement process. An analysis of the relevant literature discussing the legal implications of BIM and Information Communication Technology (ICT) implementation identifies 10 significant thematic areas and describes them in detail. These then become the theoretical framework underpinning a Qualitative Content Analysis (QCA) of the GC21 standardised Australian construction contract.

The key findings of the analysis are: a) that the GC21 contract embodies a traditional approach to design and construction that inhibits true collaboration amongst the project stakeholders; b) that by adopting a traditional approach the designer assumes further risk when undertaking and completing the design using BIM without due consideration for the additional efforts or exposure to litigation; c) that the contract does not assign any contractual status to the Building Information Model, and; d) that the contract cannot recognise this model as a contract document. In the case of the GC21 contract, this necessitates the submission of standard hardcopy drawings, specifications and proprietary Computer Aided Drawing (CAD) files, irrespective of the adoption, and subsequent accuracy/functionality, of a BIM system of work.

The significance of this research is threefold: firstly, it maps the range of legal concerns as expressed by various industry stakeholders; secondly, it develops them as a tool to analyse existing contracts and propose changes, and; finally, it provides
a reliable platform for further research – particularly the assessment of other standard conditions of contract.
Publications directly relating to this thesis

The following papers were written during candidature, reporting upon various components of the research. This was undertaken in order to a) obtain confirmation - using double blind peer review - of the relevance and currency of the research topic, and b) obtain expert feedback and endorsement of research outputs.

The candidate acknowledged the supervisory guidance he received through the co-authorship of these papers. The co-authors confirm that their contribution to these papers were limited to guidance and editing, and that the core intellectual content was generated by the candidate.


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## Abbreviations

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<th>Full Form</th>
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<tbody>
<tr>
<td>AEC</td>
<td>Architectural Engineering and Construction</td>
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<tr>
<td>BIM</td>
<td>Building Information Model</td>
</tr>
<tr>
<td>BIM</td>
<td>Building Information Modelling</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Drafting</td>
</tr>
<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
</tr>
<tr>
<td>IPD</td>
<td>Integrated Project Delivery</td>
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