Integrated Project Delivery

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Integrated Project Delivery

a project delivery method that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.

AIACC (47 words)
Quality of Documentation

Findings

• Declining standards of project documentation
• Causing 60-90% of variations
• Linked to reduction in fee level
• Led to an inefficient industry with adversarial behavior
• Cost overruns, rework extensions of time
• Diminished reputation
• Adds 10-15% to the cost of construction in Australia which amounts to $12 Billion nationally in 2006 dollars
Figure 1. Labor productivity index for US Construction Industry and all non-farm industries from 1964 through 2003.
Objectives

- Increase long term value for the owner
- Reduce time
- Eliminate waste
- Improve sustainability
- Improve profitability (with lower cost)
- Improved quality (whatever that means)
- Professional satisfaction and growth
The current reality makes it necessary to find better ways
Building Information Modelling makes it possible to do so
BIM Adoption 2009

- 2D only       24%
- 2D Mainly     26%
- Mix of 2D + 3D 44%
- 3D totally    6%

Autodesk survey
LEON ALBERTI 1404-1472

“enables one to keep a clear notion of the distribution of the elements….the setting….the quantity of the building’s parts and their arrangement….the formation of the walls….roofing etc….new solutions, even radically alter the original layout.”

Three different categories of models
1. presentation models  Florence Cathedral…competition purposes…choose from different models
2. simulate the structural features.
3. Working models built as accurately as possible to assists the mason
• Illustrations of models exhibited around 1994 of thirty-one models of extant buildings realised in the 15th and 16th centuries

• RCS Films and TV S.p.A
  Milan, Italy 1994
Building Modelling
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Building **Information** Modelling

The creation, communication and utilization of meaningful, accurate, complete and timely information
Traditional Methods + 3D

Design
The Process – Pre-Design

Pre-Design

Feasibility  Brief  Schematic  Developed  Documentation  Construction  Post-Construction

Combined

Design  Model

Check

Affinity / CodeBook
The Process – Design

Options

Analysis

Review

Modelling

Design

Documentation

Iterative Design

Model Development

STRUCTURE + SERVICES

+ SPECIALIST TRADE CONTRACTORS
Construction-Facilities Management

- Feasibility
- Brief
- Schematic
- Developed
- Documentation
- Construction
- Post-Construction

IFC CAD Model

4D modelling

Site Installation

Construction

ArchiFM

Post-Construction

ArtrA
Off-site Manufacture

- A research project for the CRC-CI to document the state of play for OSM in Australia. (Nick Blismas from RMIT)
- Drivers and barriers
- Workshops in several States
- Action Plan
- Case Studies (Skilled Park)
- Links to BIM
CRC-CI National Guidelines + Case Studies

- An initiative of the CRC-Construction Innovation to develop a document to promote a commitment to interoperability and a common direction in the Australian construction industry to the development of common strategies and standards for digital designs and construction
• To avoid the uncertainty and disparate approaches that created inefficiencies with the implementation of 2D CAD for the past three decades.
• A “managers guide” rather than a standard
• Informed through lessons learned from case studies
• Collaboration with AIA Task Force
TOWARDS INTEGRATION
Taking the Australian Construction Industry forward

WHERE WE WERE

O - 2D
Manual and CAD based (2D or 3D)

WHERE WE ARE

1 - MODELLING
Single-disciplinary use of object-based 3D modelling software within one discipline

2 - COLLABORATION
Sharing of object-based models between two or more disciplines

3 - INTEGRATION
Integration of several multi-disciplinary models using model servers or other network-based technologies

WHERE WE ARE GOING

Representation

Prototype

Full Information Capture

BUSINESS MODEL

ISOLATED

COLLABORATIVE

INTEGRATED

TRUST

Legend

Communication type
traditional
digital

UPTAKE

Australian Institute of Architects

CRC Construction Innovation
Building Wider Futures
Promotes the adoption of integrated multi-disciplinary models

- Pre-Design models
- Design models
- Construction models
- Fabrication models
- FM models
The Future

- A National Research Centre for a sustainable built environment has succeeded the CRC.
- The Guidelines development will be continued by buildingSMART Australasia
- Object Libraries and expected to be a primary focus for the SBEnrc.
Joint Contact Centre (JCC) Project
Analysing the Mass Model using IES: Energy Simulations.
Disciplines
- Architecture
- Structural
- Hydraulic
- Mechanical
- Electrical
- Civil
- Landscape
- Quantity Surveying

Software
- Affinity (design brief software)
- ArchiCAD 11 (Architectural Design Software)
- IES (Mechanical design software)
- Revit MEP (Mechanical, Hydraulics & Electrical Software)
- Revit Architecture (Architectural Documentation)
- ArchiCAD 11 (Office Interiors)
- ArchiCAD 11 (Landscaping Design)
- 12D

JCC Project
- $35 Million
- Undertaken by Project Services
- Internal consultants
- Trialling data transfer via IFC
Architectural Discipline

JCC Project

- Architecture used Revit for documentation.
- Transferring between disciplines using single stream application. Some IFC Transfer

Future Projects

- Architecture to use more of the IES analysis tools.
- Uniform Shared Co-ordinate system.
- Improve links to non Revit applications. Using IFC, GBXxml or API translators.
- Development and enhancement of cost codes linking to CostX.
- Import 12D via new IFC exporter in 12D
- Implement stages of releasing areas of information rich objects.
- modelling for other disciplines.
- Develop and enhance more
Structural Discipline

JCC Project
- Structural used Revit for documentation.
- Transferring between disciplines using single stream application. Some IFC Transfer
- Structural Model was incorporated in the Architectural.

Future Projects
- Structural to use more analysis tools linking into the model.
- Uniform Shared Co-ordinate system.
- Improve links to non Revit applications. Using IFC, GBXml or API translators.
- Development and enhancement of cost codes linking to CostX.
- Implement stages of releasing areas of modelling for other disciplines.
- Develop and enhance more information rich objects.
- Separation of models allowing ease of work flow and reduction in file size.
Mechanical Discipline

JCC Project

- Mechanical use Revit MEP
- Transferring between disciplines using single stream application.

Future Projects

- Mechanical to use more of the IES analysis tools.
- Uniform Shared Co-ordinate system.
- Improve links to non Revit applications. Using IFC, GBXml or API translators.
- Develop and enhance more information rich objects.
Hydraulics Discipline

JCC Project
- Hydraulics used Revit MEP
- Transferring between disciplines using single stream application.

Future Projects
- Hydraulics to use more of the IES analysis tools.
- Uniform Shared Co-ordinate system.
- Improve links to non Revit applications. Using IFC, GBXml or API translators.
- Develop and enhance more information rich objects.
Electrical Discipline

JCC Project

• Electrical used Revit MEP and IES.
• Transferring between disciplines using single stream application, GBXML and text inputs.

Future Projects

• Uniform Shared Co-ordinate system.
• Improve links to none Revit applications. Using, IFC, GBXML or API translators.
• Develop and enhance more information rich objects.
• Use IES at early design stage with Google Sketchup
• One room analysis via early design
• Experience, training and formal approach to ESD & design, mechanical, electrical, architect
• Building library elements to have built-in wiring rules from AS3000 inputted directly into both Revit & IES.
Office Interiors Discipline

JCC Project
- Office Interiors used ArchiCAD for documentation.
- Transferring between disciplines using IFC Transfer
- We also export a DWG file to allow 2D information in.
- We then export an IFC file with just the joinery elements as a link file into the Revit file.

Future Projects
- Improve links to Revit applications. Using, IFC, GBXML or API translators.
- Development and enhancement of cost codes linking to CostX.
- Develop and enhance more information rich objects.
Landscaping Discipline

JCC Project
- Landscaping used AutoCAD for documentation.
- Transferring between disciplines using 2D CAD methods.

Future Projects
- ArchicAD to be used by other users within the Landscaping area
- Links with 12D as platform levels and 3D Landscaping surface levels
- Utilising developed and enhance information rich objects.
- Implement stages of releasing areas of modelling for other disciplines.
Clash Detection & Navisworks

JCC Project
- Clash Detection reports run with Navisworks.
- Navisworks Viewer allow other users to view the model.

Future Projects
- Refine Clash reports
- Utilize 4D with in Navisworks with links back to CostX
- Link hyperlinks to elements for maintenance manuals to give to clients through viewers.
Solibri Model Viewer

JCC Project

- Clash Detection reports run with Solibri.
- Solibri file were given to contractors for intergrading the model in tender stages.

Future Projects

- Create set rules in solibri
- Training and rollout of viewers to all CAD users for checking.
JCC Green Star

- Using Modelling and analysis to assist in Green design
- Lighting and Glare Analysis to maximise natural lighting
Integrated Project Delivery

- Joint working party of the Australian Procurement and Construction Council (APCC) and the Australian Construction Industry forum (ACIF)
- A more collaborative and accountable delivery model that needs to engage with the whole team of consultants, contractor and specialist trade contractors during design stages and beyond
- Can engage with off-site manufacture better
- Alliancing delivery to client appointed team based on capacity to work together
- Issues of probity, value for money and establishment costs
- Complexity of the industry
- Very compatible with digital design and modelling
Model server

- minimize product life-cycle costs
- provide product life cycle support (PLCS)
- ensure data integrity
- collaborate in virtual or extended enterprises
- shorten product development cycles
- support concurrent product and process development
- respond with agility to changing customer needs
Integrated Project Delivery

Managing Contractor

Design

Analysis

Check

4D modelling

Facilities management

Specialist Trade Contractors

Suppliers

Feasibility

Brief

Pre-Design

Design

Documentation

Construction

Post-Construction

Iterative Development

Model Development

Structural Services

Collaboration

ICIS

Project Services
Role Changes & Partnerships

Changes may include

- CAD Draftsperson Changing into Construction modellers
- Sub-Contractors, Builders and Suppliers being consultants at design stages of projects.
- Emphases on Design Stages and minimizing Documentation Stages. Ownership and transfers of models with Design and Documentation Stages.
- Introduction of one person to co-ordinate these processes
  BIM Manager
Specification

• A quality control document
• Information complementary to the drawings
• What role will it play in the future?
Building Modelling

Questions