

BIM & Blockchain

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Dr. Abel Maciel

Bartlett Faculty Of The Built Environments

University College London





Dr. Abel Maciel

Qualifications

Royal Institute of British Architects (RIBA)
Architects Registration Board (ARB)
Masters of Architecture (M.Arch)
Engineering Doctorate in Virtual Environments, Imaging and Visualization (EngD)

Academic positions

Senior Research Fellow
The Bartlett Faculty of the Built Environment
University College London
Hyperledger Academic Partner at UCL
Frontiers Expert and Editor

Research collaborations

Architectural Association - London
Ecole Spéciale d'Architecture (ESA) - Paris
University of Nottingham
University of Sydney
The Alan Turing Institute

Research Projects



Founding Director of Design Computation Knowledge platform, including topics like AI/ ML, HCI, CSCD, PIM/ BIM, BM/ GT, DLT/ Blockchain



Founding Director and Academic Lead of the Construction Blockchain Consortium (CBC)



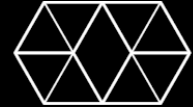
Director of Construction Workgroup



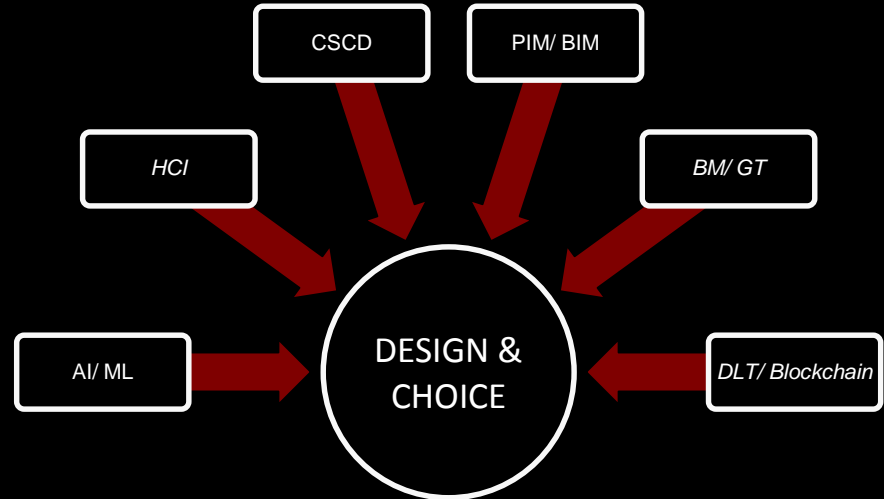
WWW.DESIGNCOMPUTATION.COM



WWW.DESIGNCOMPUTATION.ORG



WWW.CONSTRUCTIONBLOCKCHAIN.ORG





Design Computation Ltd.

PRACTICE

Design Computation is a specialist small consultancy based in London. We are focused on the development and delivery of complex Building Information Modelling, Programmatic Design and Smart Contracts. We are architects, engineers and researchers with extensive experience on a wide range of design typologies and scales. Our practice ranges from product and interaction design, to large-scale urban complexes and masterplans.

CLIENTS

We are privileged to work with some of the world's leading design practices and to assist them directly and indirectly to deliver the 'impossible' and the 'unique'. Some of our clients are:

Heatherwick Studio | Buro Happold | ARUP | Zaha Hadid Architects | Foster & Partners |
Autodesk | UCL | Mishcon






APPLE CAMPUS
FOSTER + PARTNERS, EOC



GOOGLE CAMPUS
HEATHERWICK STUDIO + BIG



THE VESSEL
HEATHERWICK STUDIO, 2018



ROYAL THEATRE OF RABAT
ZAHA HADID ARCHITECTS



Construction Blockchain Consortium

Mission Statement

The Construction Blockchain Consortium (CBC) supports knowledge transfer, arranges commercial and academic presentation, assesses and tests commercial services and technology, conducts research, and drives policy, regulation and understanding of the radical consequences of technology and services. Where required we also develop proprietary technology and services for the consortium members; using both outside contractors, and leveraging PhD and Masters students. Thus, services might include the following:

Knowledge Transfer

To track and distil emerging technologies for construction.

Research & Development

To build pre-competitive proof-of-concept and generate IP.

Education & Training

Enhancing and re-skilling professionals staff required to deploy the new technologies.

UCL believes the most effective way to do this is a knowledge transfer and R&D consortium.





Construction Blockchain Consortium

Academic Leaders



PROF. PHILIP TRELOAR
University College London



PROF. ALAN PEHV
University College London



DR. ABEL MACIEL
University College London
Swegen Consortium
UCL

Central Committee



DR. ELENI PAPANONIKOLAKI
Associate Professor
Architecture, Planning,
and Management
The Bartlett School of
Architecture & Planning
Management
UCL



ALEXEY AISH
Head of Analytics and
Platform Strategy
Mott MacDonald U.K.



THOMAS ASTE
Professor of Technology
Innovation
Head of Digital
Construction
The Bartlett School of
Architecture
UCL



ROBERT AISH
Executive Director
Centre for Blockchain
Innovation (CBI) UCL
University College
London



PROF. ROBERT AISH
Professor
Architecture
UCL



PROF. ROBERT AISH
Professor of Urban
Development
The Bartlett School of
Architecture
University College
London



FRANCES AISH
Head of Spatial
Development
Urban and Planning
UCL



SIMON RAWLINSON
Professor
Head of Strategic
Research and Digital
Innovation
UCL



DARYA BAHRAM
University Fellow in
the Management of
Complexity (MOC)
UCL



JOHN WOOD
Director - Innovation
UCL



BILL WOOD
Senior Research Fellow
The Bartlett School of
Architecture
University College
London



ARSEN SCHUM
Professor
UCL

Steering Committee - USA



ANDREW C. LINDSEY
Managing & Strategic
Development Executive
Steering Committee
UCL



JETI BARR
Project Management
Consultant at PwC
UCL



ELENI PAPANONIKOLAKI
UCL

French Committee
In collaboration with the
CSTB

Australian Committee TBC

Technical Committee

AEC & BIM

- Abel Maciel
- Adan Davis
- Francis Aish
- Robert Aish
- Simon Rawlinson

FinTech

- Tomaso Aste
- Joel Dudley

Legal

- Darya Bahram
- Jeremy Barnett

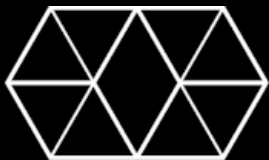
Construction Management

- Eleni Papadonikolaki

Open Source Software

- Tassos Varoudis
- Joel Dudley
- Marta Piekarska





Construction Blockchain Consortium

Open-Source Projects

- Financing & Procurement
- Distributed BIM
- Policy & Compliance



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BIM & BLOCKCHAIN: RISKS & PROSPECTS





BIM Research

Properties:

- Digital prototype
- Collaborative
- Parametric
- Transactional

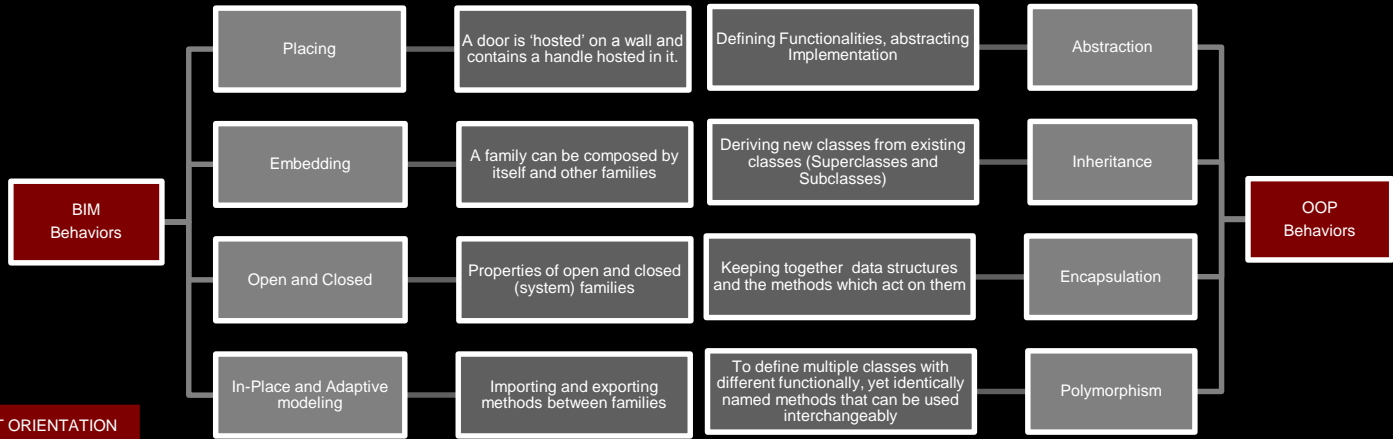
Implications:

Complex
Difficult adoption
Fundamental for the
Construction 4.0

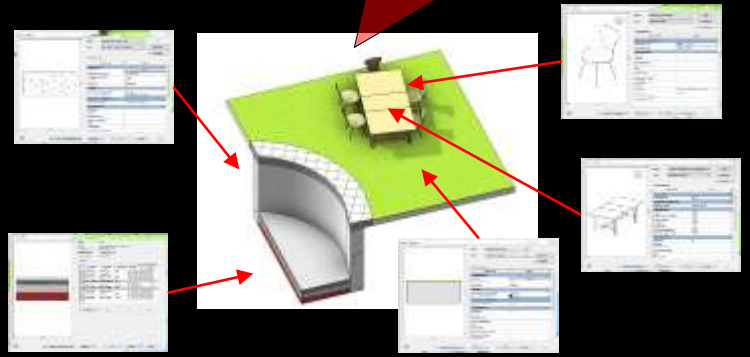


BIM Transactions: An Object-Oriented Production

Data Richness



PARAMETRIC OBJECT ORIENTATION



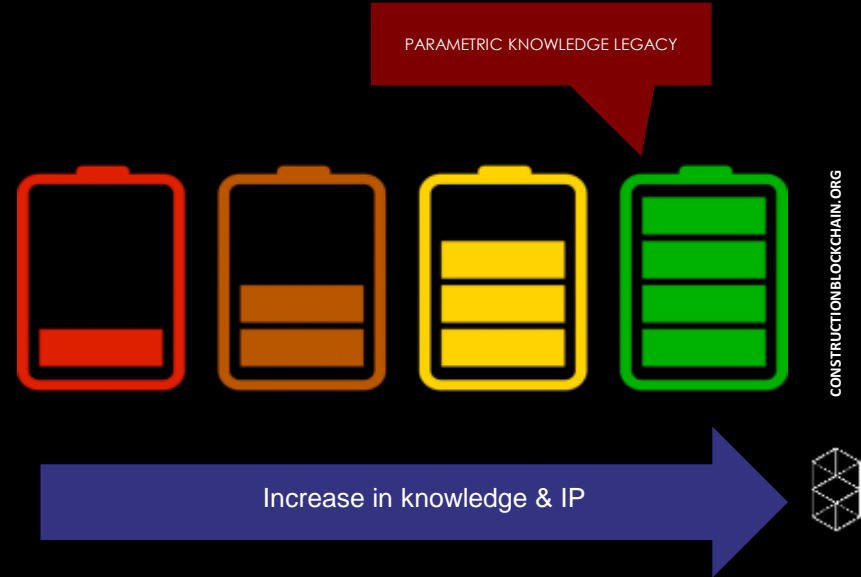
BIM Collaboration: How can it evolve?

A front-loaded process

BIM creates a framework for a knowledge legacy and all data generated for one project can be reused on later projects.

As a knowledge management platform, BIM can dramatically shorten the time to deploy new projects and increase efficiencies and quality over time.

But...



BIM Collaboration: The wider ecosystem



‘An intrinsic link between the *Digital* and the *Physical*.’



BIM Collaboration: The wider ecosystem



‘An intrinsic link between the *Digital* and the *Physical*.’

‘What are the *risks* and *prospects* of this new era?’



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‘This is the fastest, most unpredictable & ubiquitous revolution.’



BIM Collaboration: The wider ecosystem



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BLACK MIRROR



社会信用体系 (Social Credit)

Fake News



Manufacturing Opinions

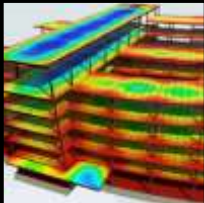
Complex Accountabilities



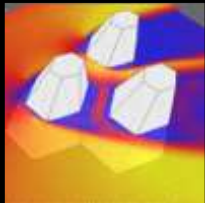
...with direct impact in the physical world



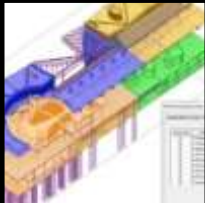
BIM Collaboration: The wider ecosystem



Cloud Computing



Concept Simulation



CSCW/D



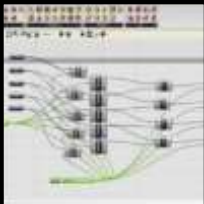
Decision-Making



Big Data



Metadata



Programmatic Design



Reality Capture



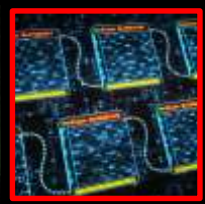
Virtualization



BMS



VE



DLT





Blockchain Research

Properties:

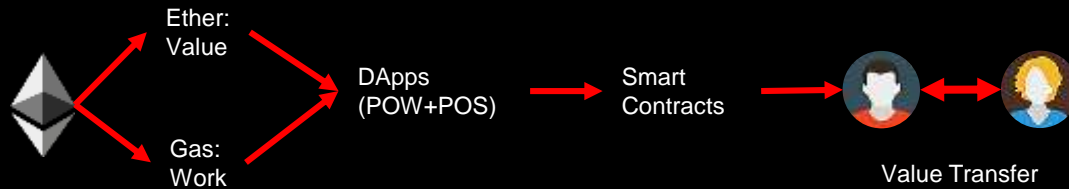
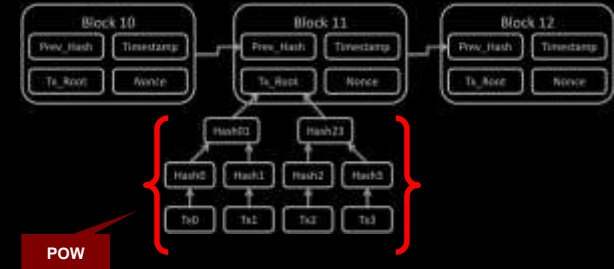
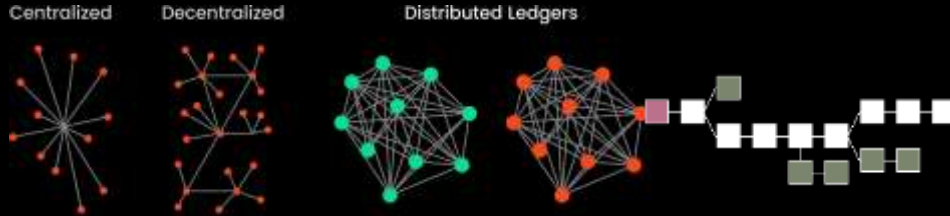
- Fundamental & Disruptive
- Distributed
- Immutable
- Data provenance
- Data purpose

Implications:

- A network of Value
- Cultural (Transparency & Trust)
- Automation
- Accountability
- Modulation of Data



Emerging technologies – DLT & Blockchain





Smart Legal Contracts

Properties:

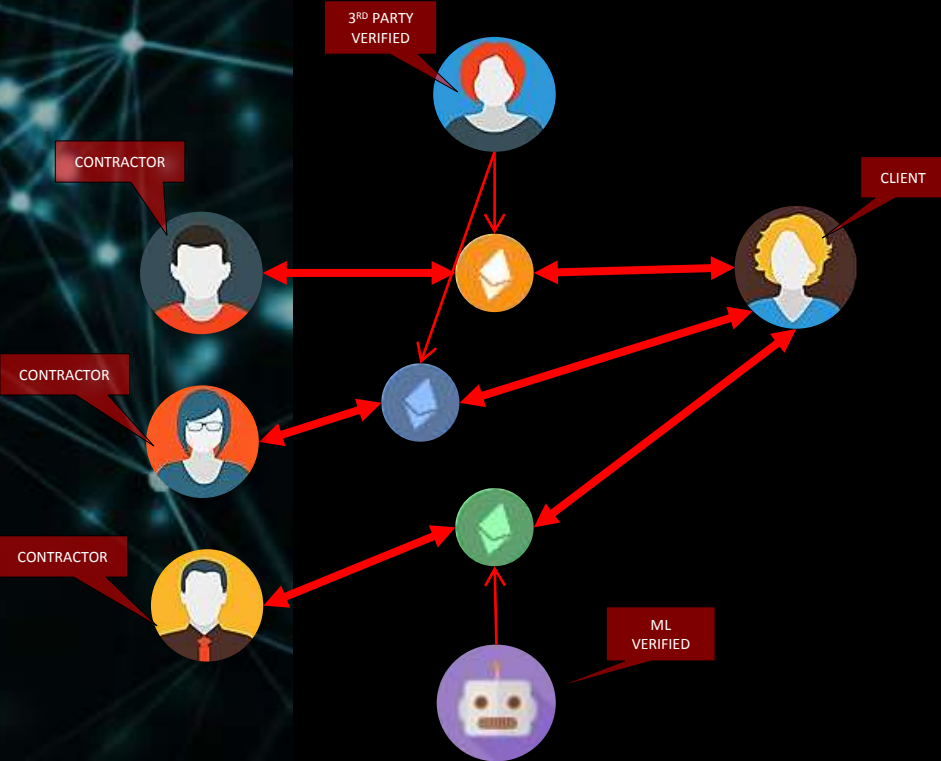
- Automated
- Pro-active (vs. reactive)
- Resilient
- Auditable
- Intelligent

Implications:

- Untested
- The promise of unforeseen efficiencies in the sector
- A foundation technology for the intelligent environments
- Eradication of corruption
- Transparent global development

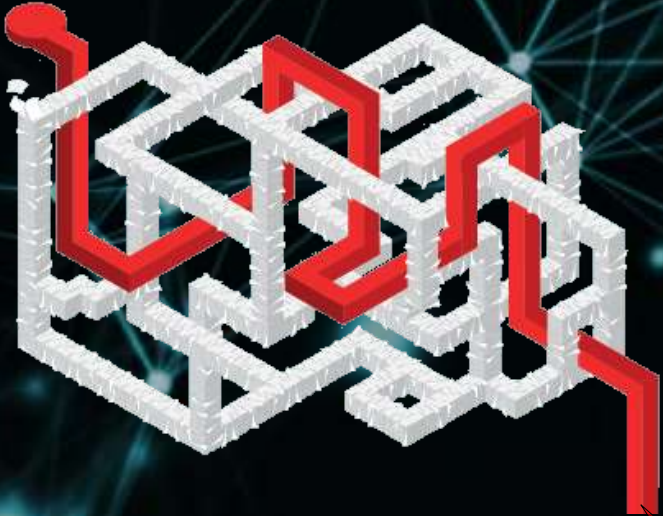


Smart Legal Contracts



Accountability chains

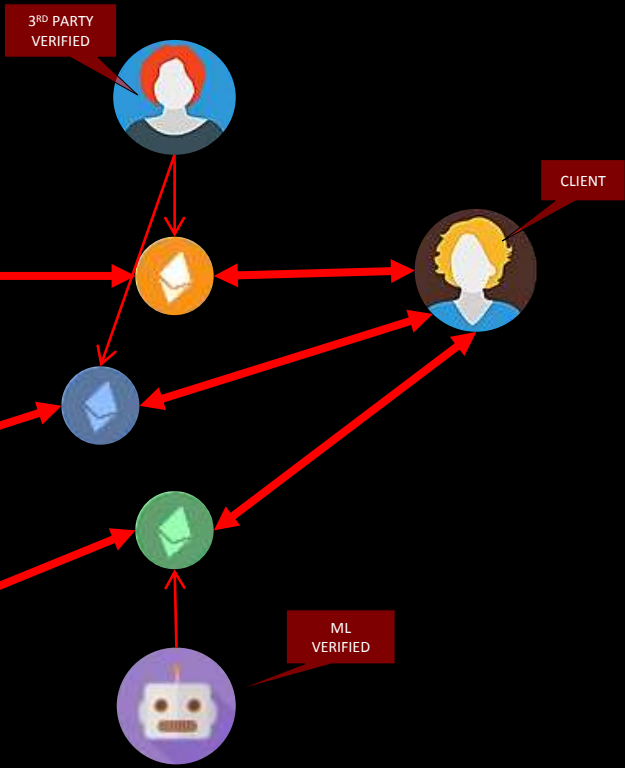
SUPPLY CHAIN or DESIGN PROCESS



IMUTABLE, AUDITABLE REGISTRY



Smart Legal Contracts



3RD PARTY VERIFIED

CONTRACTOR

CONTRACTOR

CONTRACTOR

CLIENT

ML VERIFIED



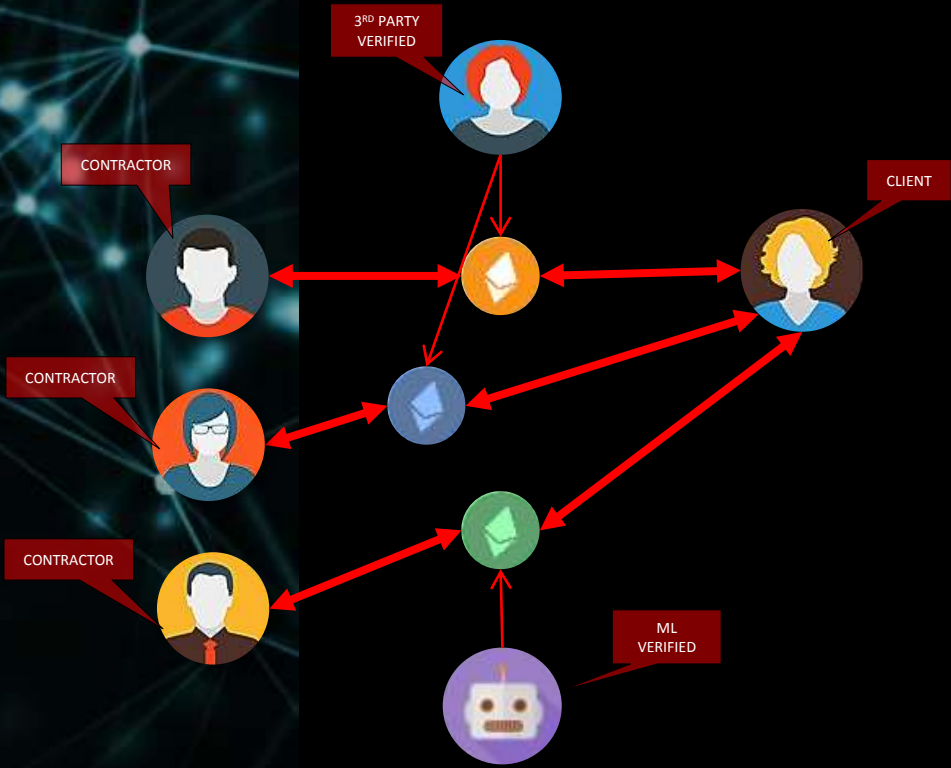
Accountability chains

PUBLIC LEDGER



IMPOSSIBLE TO ADULTERATE

Smart Legal Contracts



Modelling Design Interaction

An **REAL** interaction model depicting Design Thinking:

Based on the empirical data

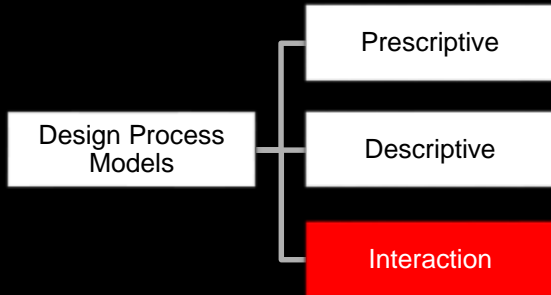
Focus on semantics of sequencing/activities;

Interaction are strategic moves;

Focus on value of trade-offs

(C.A. Le Dantec and E.Yi-Luen Do);

If nobody knows...we need to observe;



Types of games (from simple to complex):

Static Game of complete information

Dynamic games of complete information

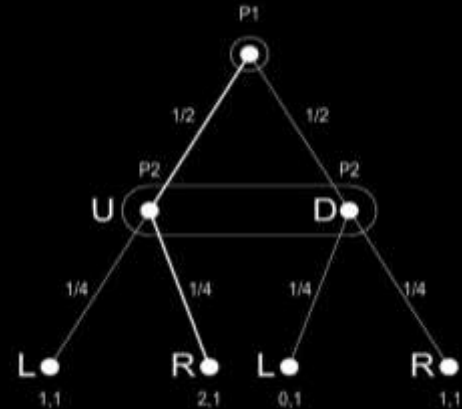
Static games of incomplete information

Dynamic games with imperfect information

A SIMPLE COORDINATION GAME

Player 2

	L	R
Player 1 U	1,1	0,1
D	2,1	1,1



Kuhn game tree





Legal DAOs and BIM

Prospects:

BIM as the platform to revolutionise Building Procurement

'Mass Localization' of resources

New models of Construction financing via BIM

Algorithmic PM measures of contribution utility will lead to a benefit to all tears of construction





How to engage:

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