



# A Quantitative Investigation into how Building Information Modelling has Affected the Transfer of Information on Construction Projects

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and

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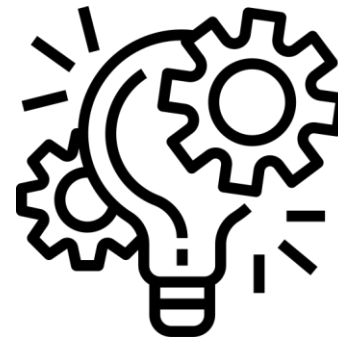
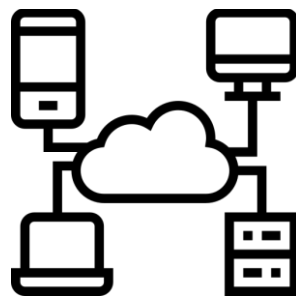
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# The case for BIM: Project Stakeholders' perspective



- BIM adoption rates have increased by an average of 8% each year since 2012 (2017 National Building Society's Annual BIM Report)
  - However, Engineers and Contractors only made up 8% of responses.
- Similarly, only 46% of Engineers in the McGraw Hill Smart Market Report (2014) found BIM to have a positive ROI.



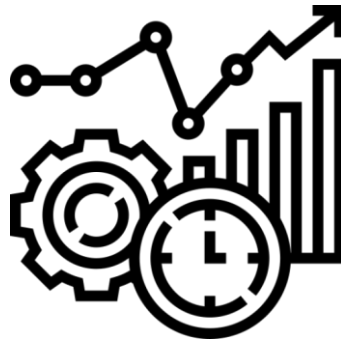
# What is an RFI?



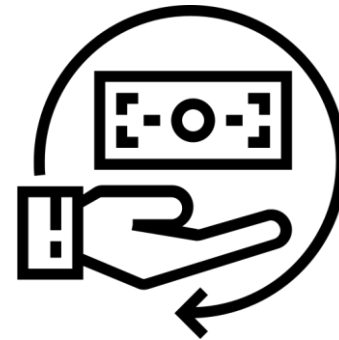
- The need for RFIs may arise due to site conditions, suggestions for improvement, inconsistencies between design disciplines, drafting errors and detail omissions (Burns 2007; Shim et al., 2016).



Acharya and  
Lee, 2006.



Hanna et al., 2012;  
Hughes et al., 2013;  
Awad et al., 2012



Hughes et al.,  
2013



Hughes et al. (2013) and Hanna et al. (2012) established that two quantitative metrics to monitor a projects performance :

1. The percentage of RFIs answered within the requested time period
- 2.The total amount of RFIs per million dollars of award contract

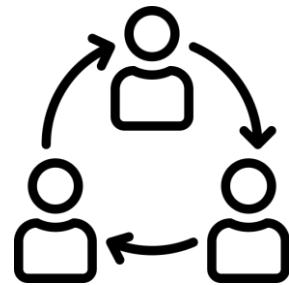


Although research has been carried out on the RFI process and its effect on project efficiency, little or no research has specifically evaluated effects on RFI processing efficiency as a direct result of BIM.



BIM has been found to improve the transfer of information on construction projects. Therefore, it should impact the RFI procedure in 3 ways:

- 1. Improved average response times for all RFIs.
- 2. Higher percentage of on-time vs late RFI responses.
- 3. Lower number of RFIs issued per million euro of award contract.



Vs







This study aims to examine:

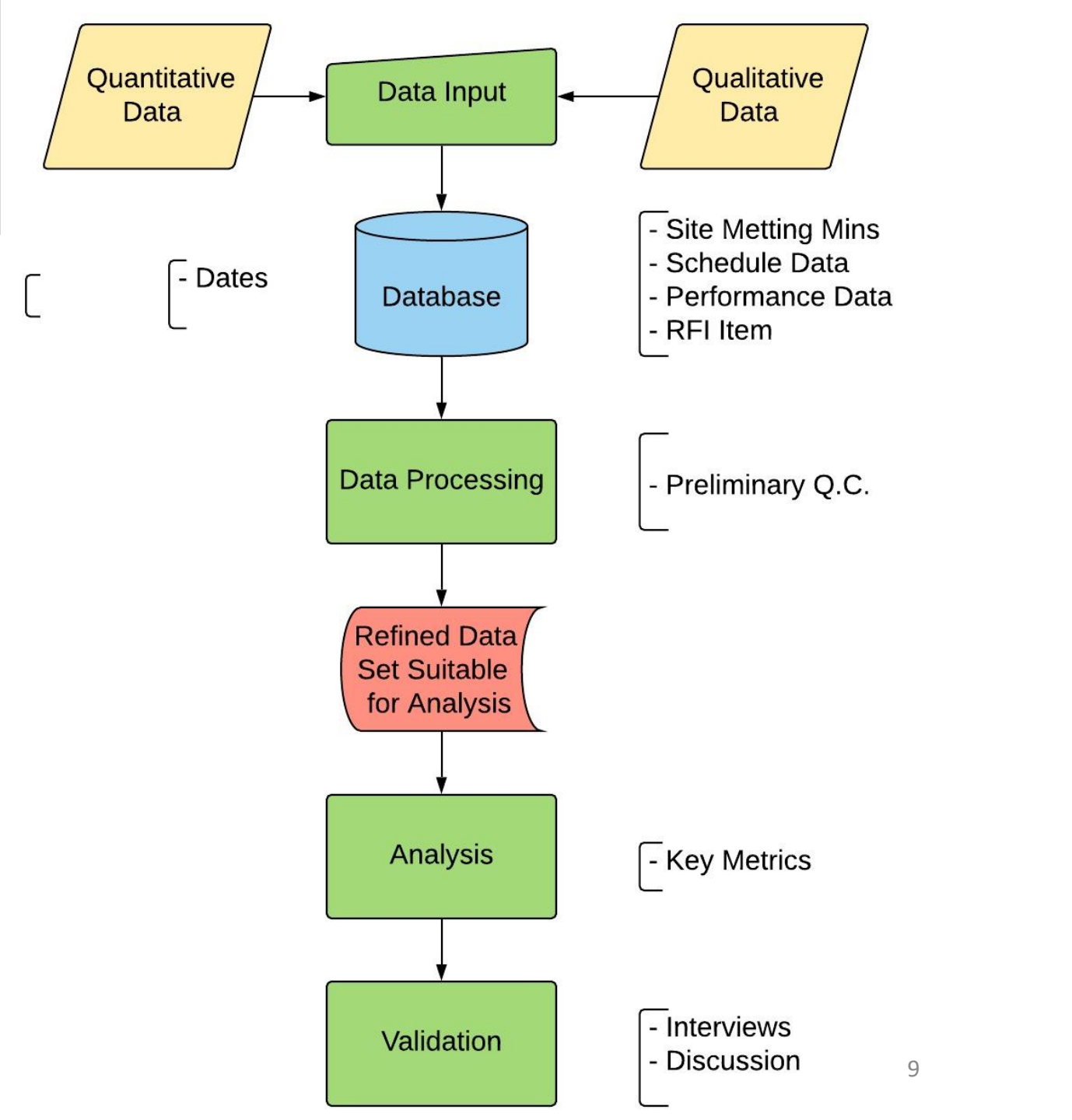
1. The total amount and frequency of RFI submissions throughout the duration of the BIM level 1 project.
2. The average and median response times for single party Vs multi-party RFIs.
3. Median response times per discipline involved in the BIM level 1 project.
4. A % of on-time and late responses for single party Vs multi-party RFIs.
5. Total amount of RFIs issued per million euro of award contract.



# Research Activities



# Research Methodology





<b>Location</b>	Dublin, Ireland
<b>Contract Value</b>	€20m (3-storey office block)
<b>Building Type</b>	Reinforced Concrete
<b>Area</b>	9700 m <sup>2</sup>
<b>Delivery Method</b>	Construction Management

- A BIM managed 3D CAD model was created during design in accordance with BS 1192:2007
- 2D drawing deliverables were extracted from model and issued to the main contractor
- The project team: 26 different stakeholders
- Regular site meetings took place between project stakeholders during construction.
- An online system was used to log RFIs, progress reports & meeting minutes - shared via CDE



Project Delivery Issue	Number of Documents (files)
Requests for Information	68
Site Meeting Minutes	28
Progress Report	27
Coordination Meeting Minutes	6
BCAR Meeting Minutes	7
Supplementary Documents	10
Total Documents	<b>145</b>



## Response Time (Days)

Item #	RFI Description	RFI No.	Month	Attention of:	Date Requested	Date Response is Required	Days until required	Date Received	Days to respond	Late/ On-Time?	Late/ On-time by (days)	Late Category
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Multi-party  
or  
Single Party RFI

Descriptive Statistics from a  
measure of spread:

Late Scale	1	2	3	4
Time	1-7 Days	8-14 days	14-30days	30+ days



The total amount and frequency of RFI submissions throughout the duration of the BIM level 1 project:

66

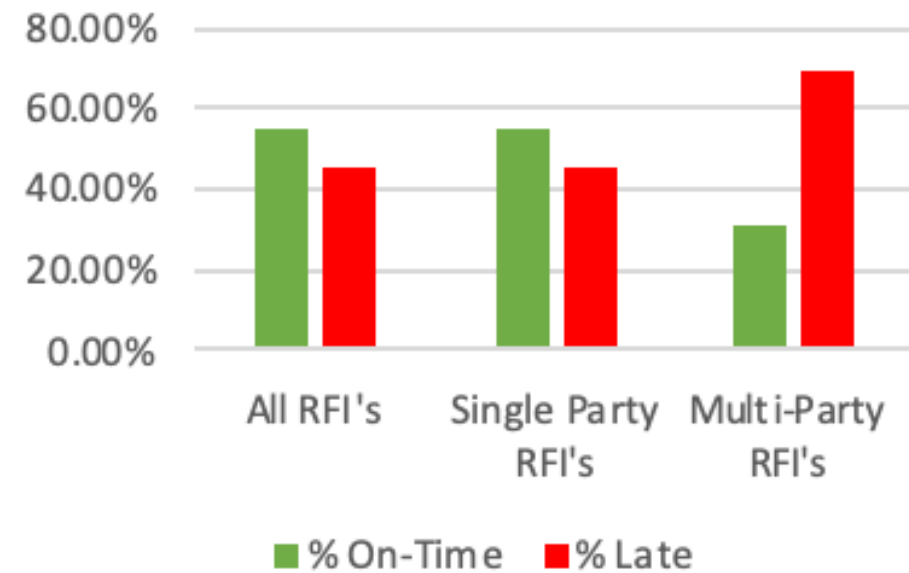
RFIs issued throughout  
duration of project

59%

Of all RFIs issued within  
first 4 months



% Late RFI's vs % On-time RFI's



55%

Single-party RFIs were responded to on-time

45%

Single-party RFIs took 8 days or more for a response

30%

Multi-party RFIs were responded to on-time

70%

Multi-party RFIs took 8 days or more for a response



# Average & median response times for single party versus multiple party RFIs



15 days

Median Response time  
for single party RFIs

16.5 days

Median Response time  
for multi-party RFIs

11 days

Median time **given** for  
single party RFIs

14 days

Median time **given** for  
multi-party RFIs

# Total amount of RFIs issued per million euro of award contract



3.3

Vs

17.2

RFIs issued per million euro of  
award contract

RFIs issued per million dollars of award  
contract, found by Hughes et al. (2013)

3%

Vs

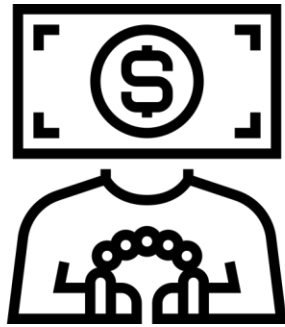
22%

Of all RFIs received no response in  
the BIM level 1 project

Of all RFIs received no response in the  
European results found by Hughes



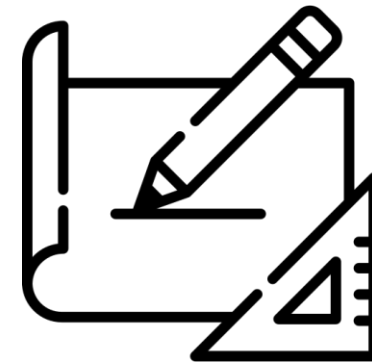
# Key Findings



RFI Abuse



System integration



Designing to spec vs needs



## BIM level 2 - ISO 19650

- RFI categorization, cost and schedule impact via pre-determined metadata lists on BIM level 2 CDE
- Role of Project Information Manager



# Thanks!

Steven O' Brien and James O'Donnell



# CitA

BIM GATHERING 2019



**4th CitA BIM Gathering** 26th September 2019, Galway, Ireland.

Delivering **better outcomes**  
for Irish Construction









Thank you