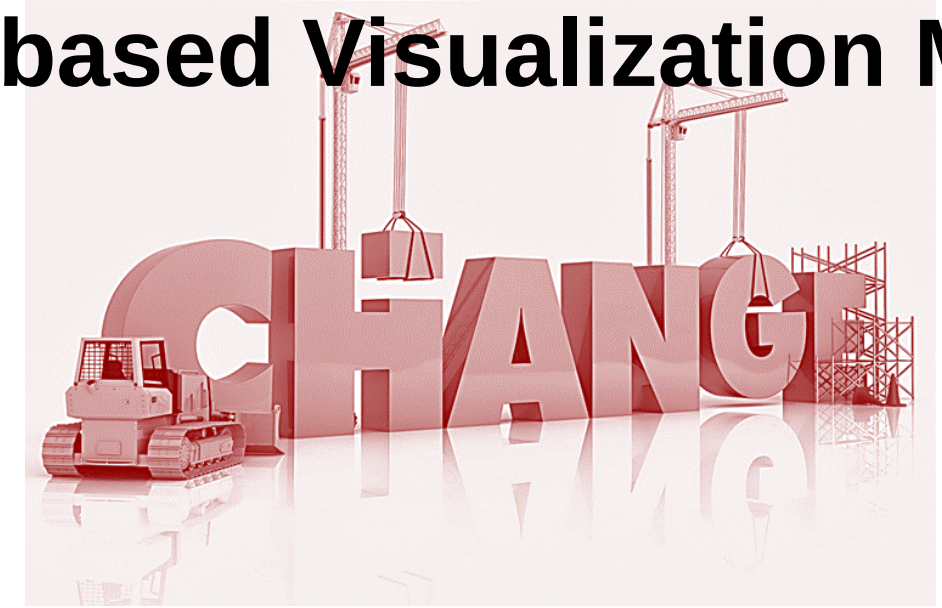
# Design Change Management Using a BIM-based Visualization Model

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# Outline

- Introduction
- Background
- Proposed Methodology
- Case Study
- Conclusion

- What is change?


Leonard, Moselhi (1988), Antill et al. (1990), Ibbs C. W. et al. (1995), Mokbel et al. (2003), Ibbs, W. et al. (2005), Ming Sun a. X. et al. (2009)

# Story

The followings are the words of the estimator for the general contractor:

"we knew we had been clobbered, but we didn't know what had hit us. It was like walking down a dark alley midnight and waking up the next day in a hospital bed. The police want to know who hit us. You don't even know what happen."…

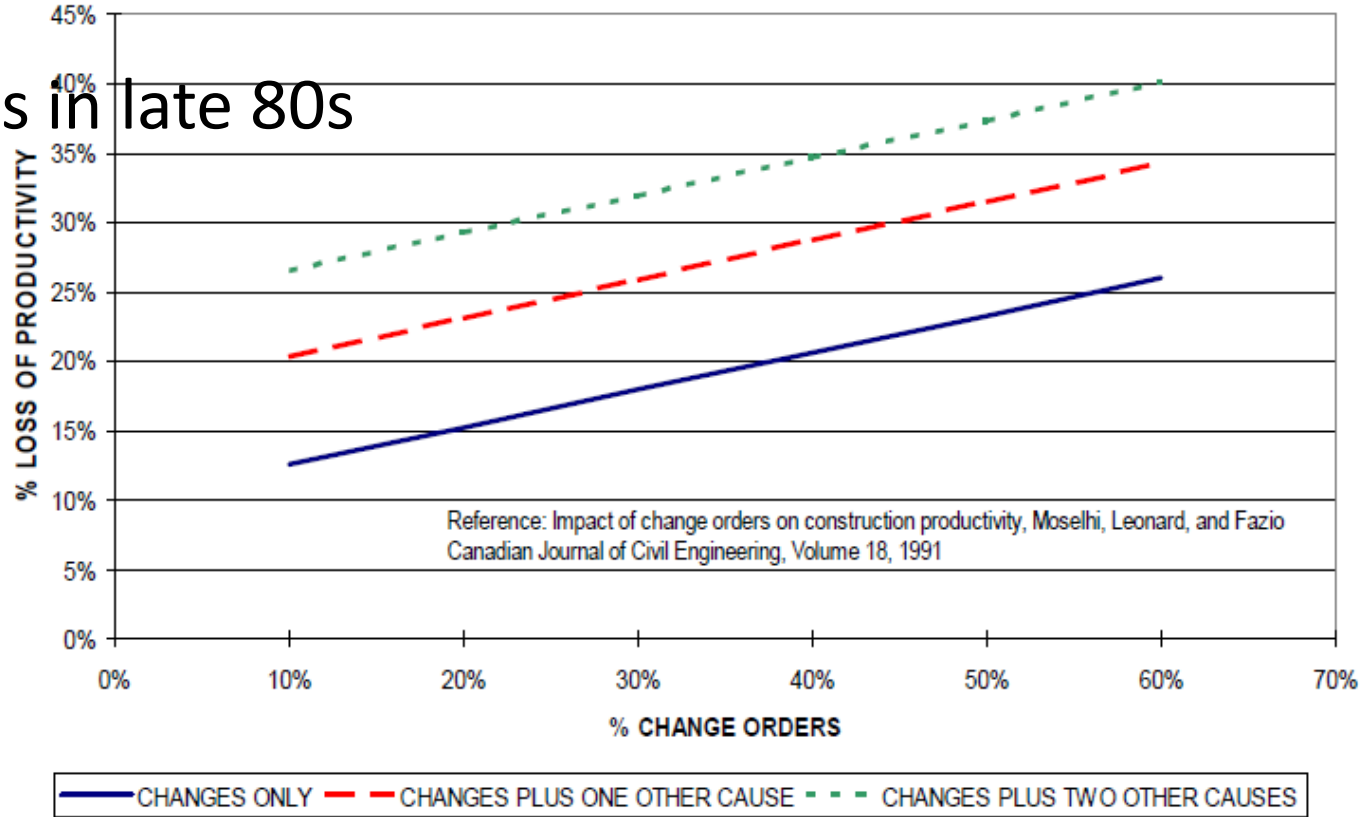
**AACE 1970**

# Story

# Story

"So, gentlemen, I think this pretty well concludes what I have to say on this subject. It's a field that is grossly misunderstood and needs more study. It's a tremendous problem, and much remains to be studied"

- Our models in late 80s
- B. Ibbs
- Others



- In US, cost of change could reach $50 billion per year with the additional spent on claims and legal disputes (Ibbs and Allen 1995)

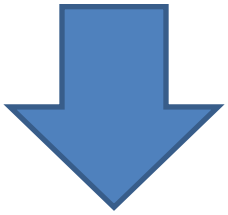
- 50% of the surveyed projects were suffered from delays due to changes (Kumaraswamy et al. 1998)


- Changes caused 70% of the construction projects in Saudi Arabia faced with delay (Assaf et al. 2006)

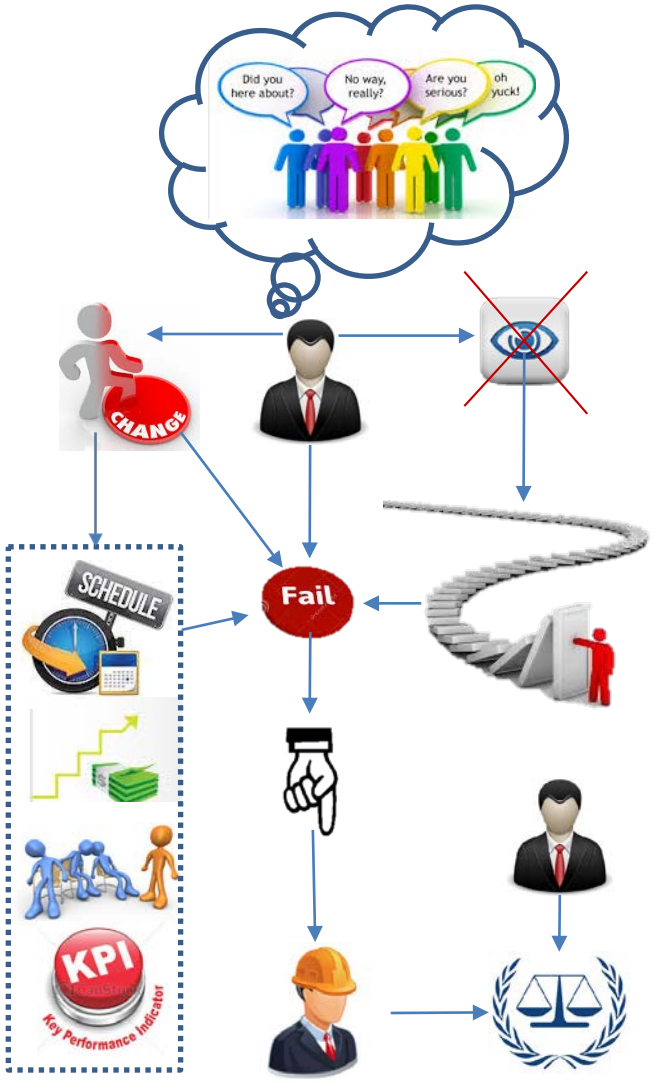
# Introduction



- Owners request changes at any phase of a project to respond to new market demands
- Owners may not realize the consequences of their requested changes

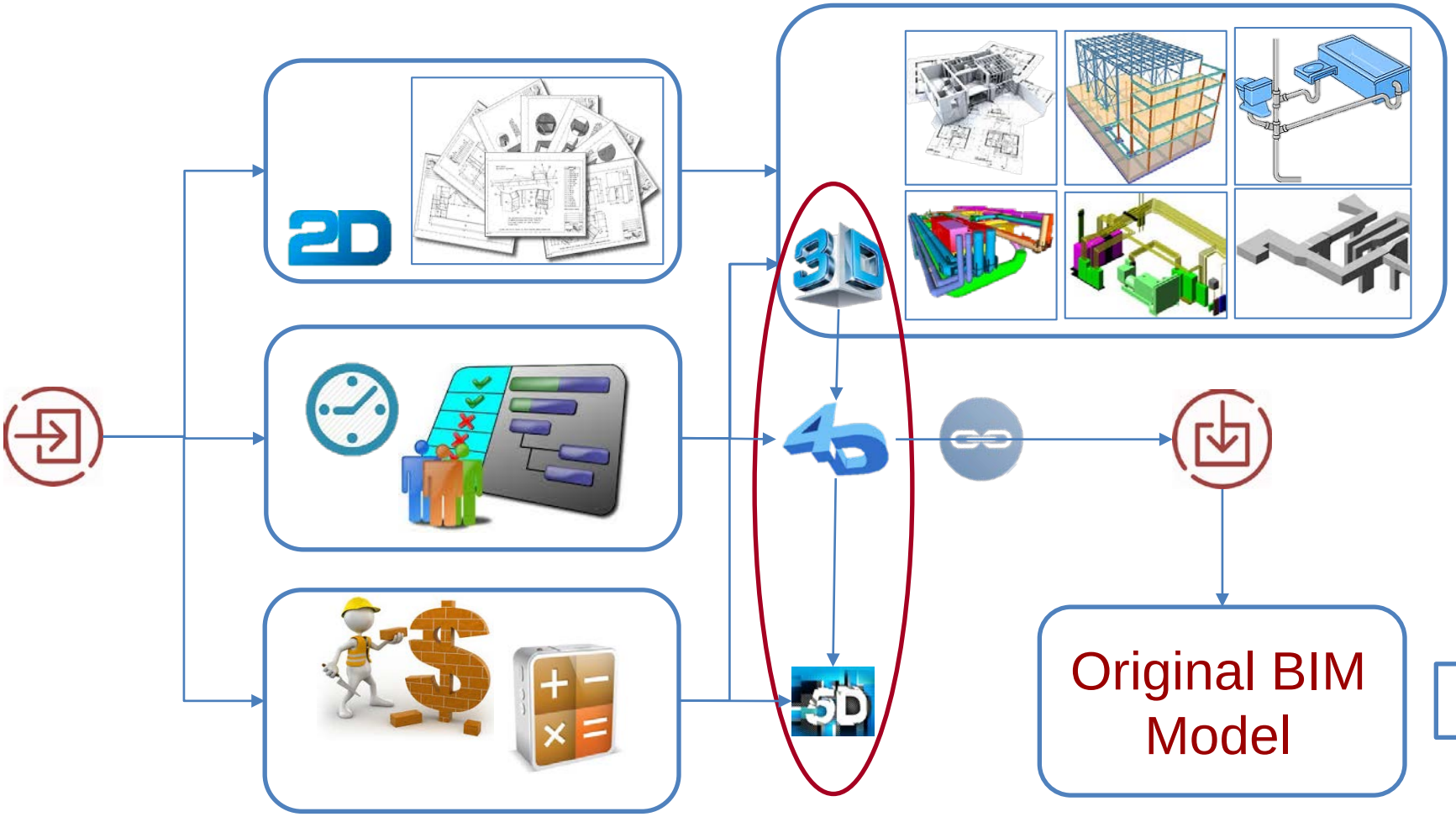


- Changes Impact the project's
  - Schedule
  - Cost
  - Project overall performance



# Proposed Methodology

| Data Acquisition Framework | Data Analysis Framework | Reporting Framework |
|---|---|---|



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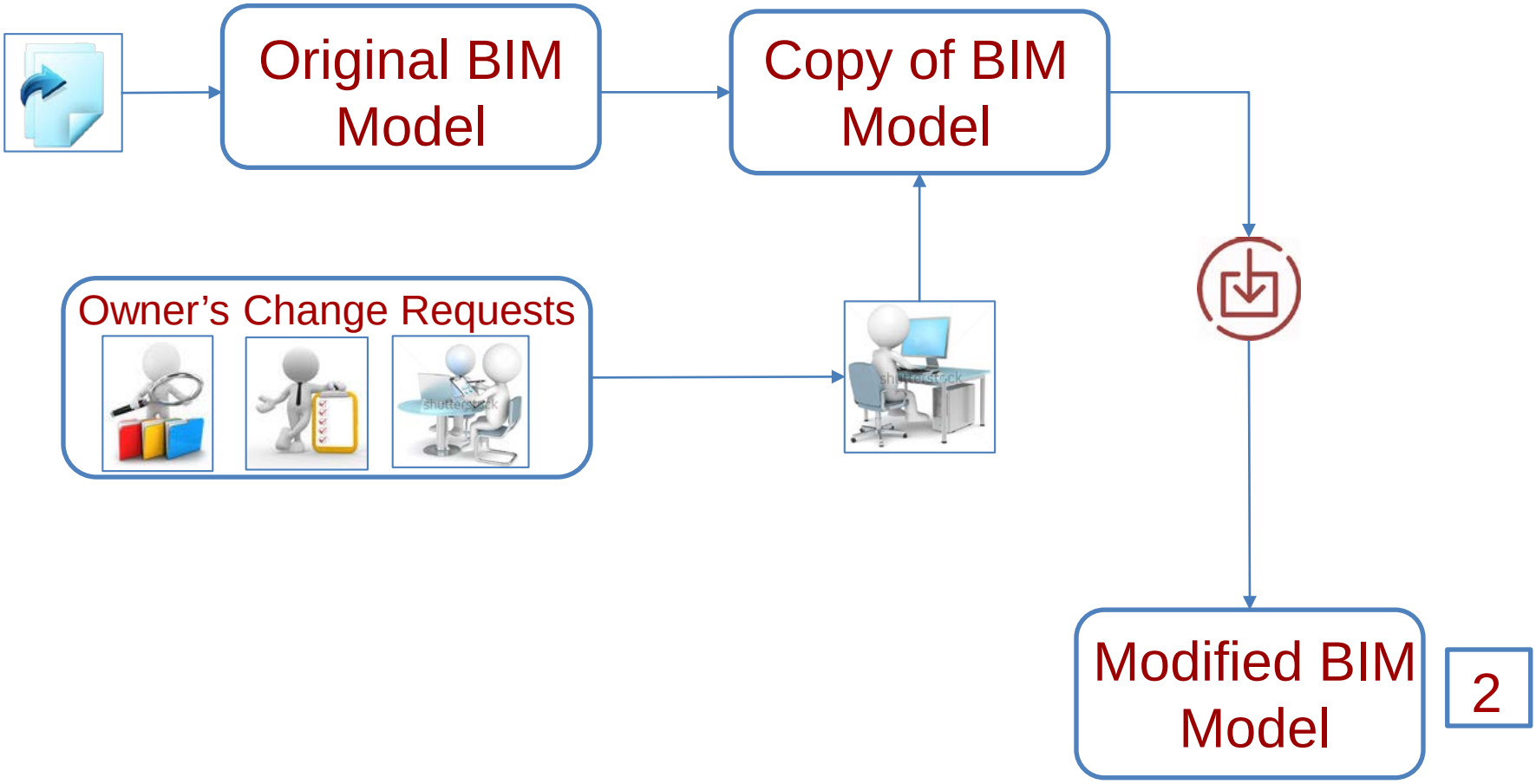

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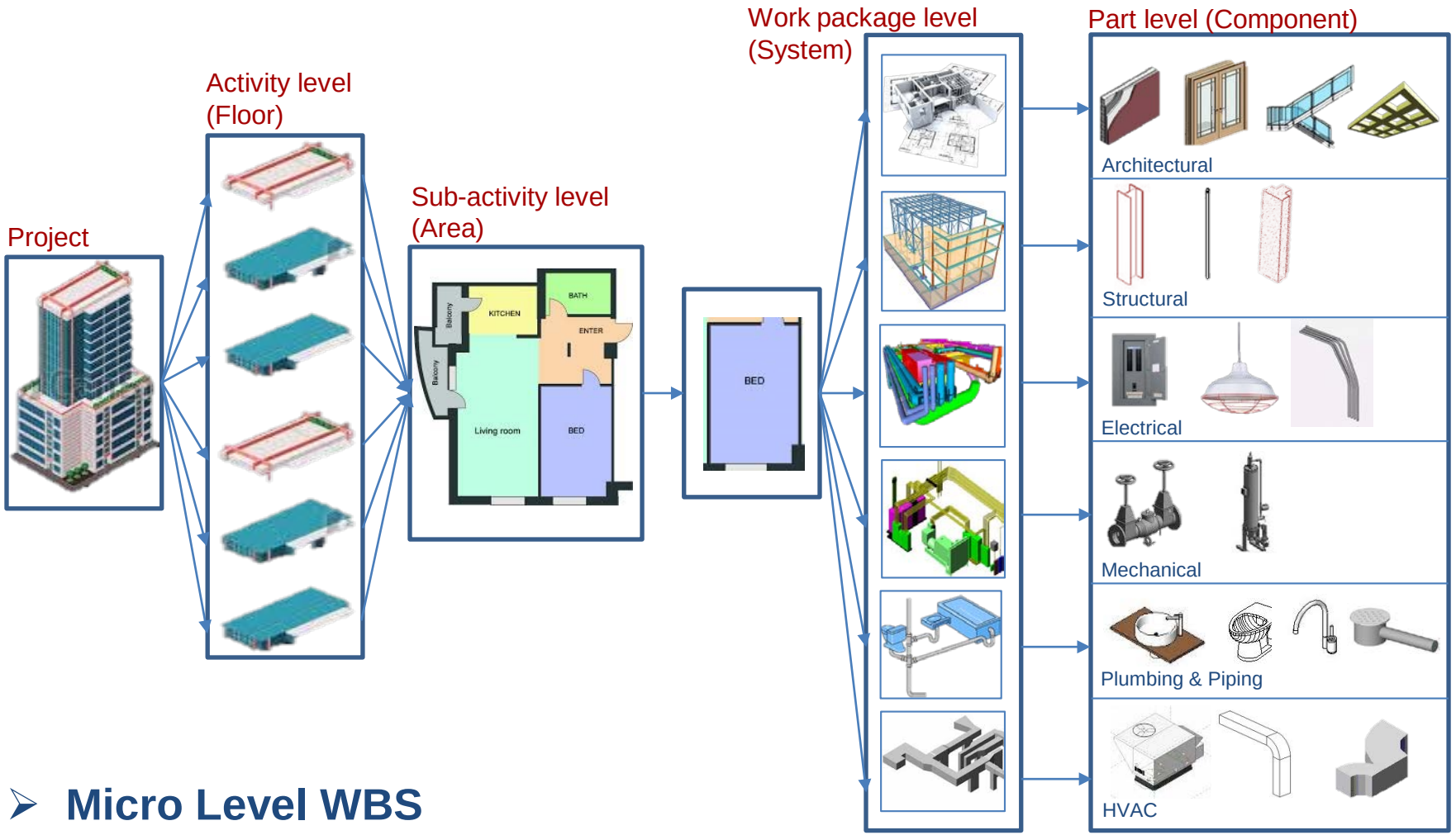
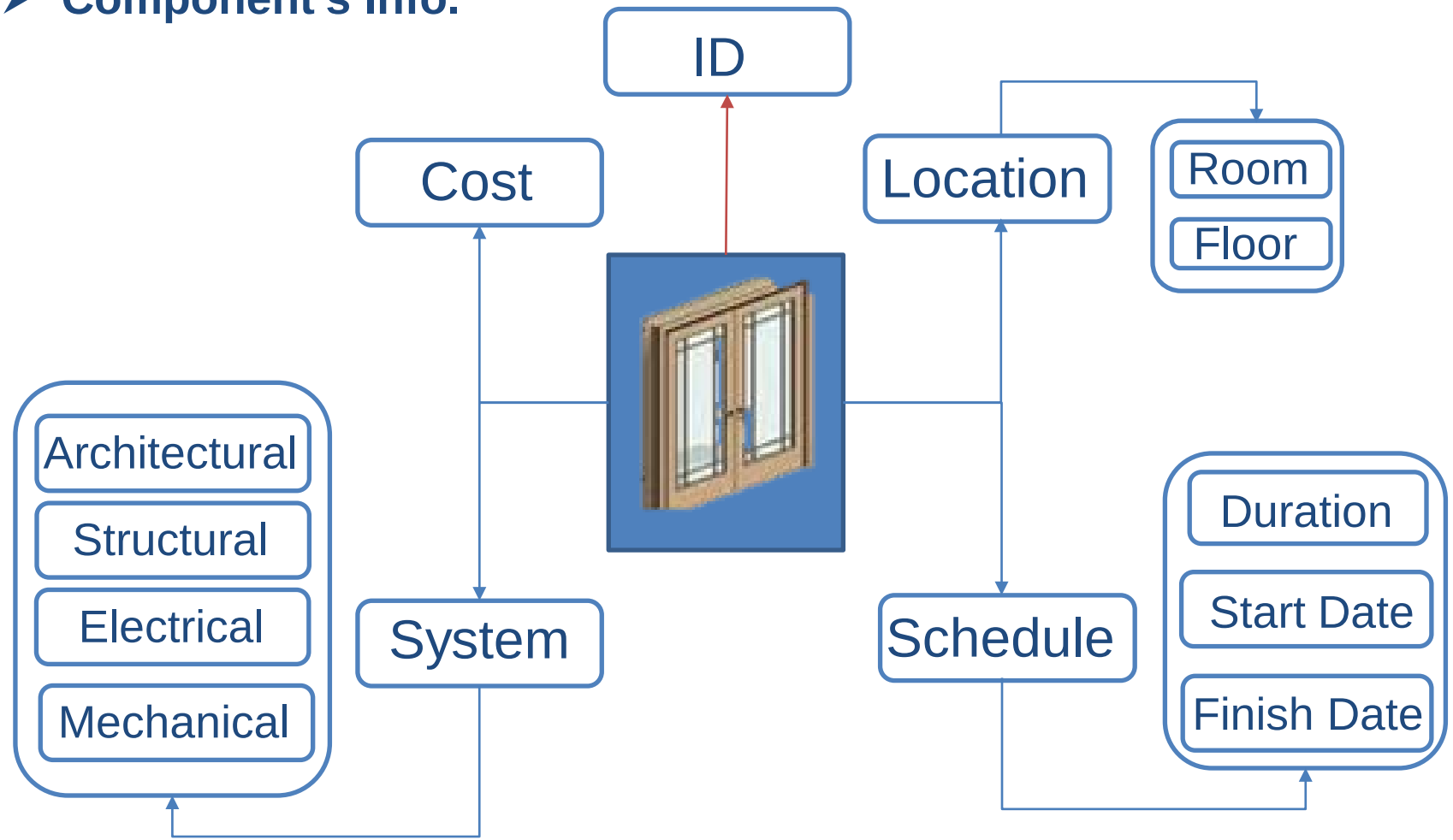



➢ **Micro Level WBS**

# Proposed Methodology

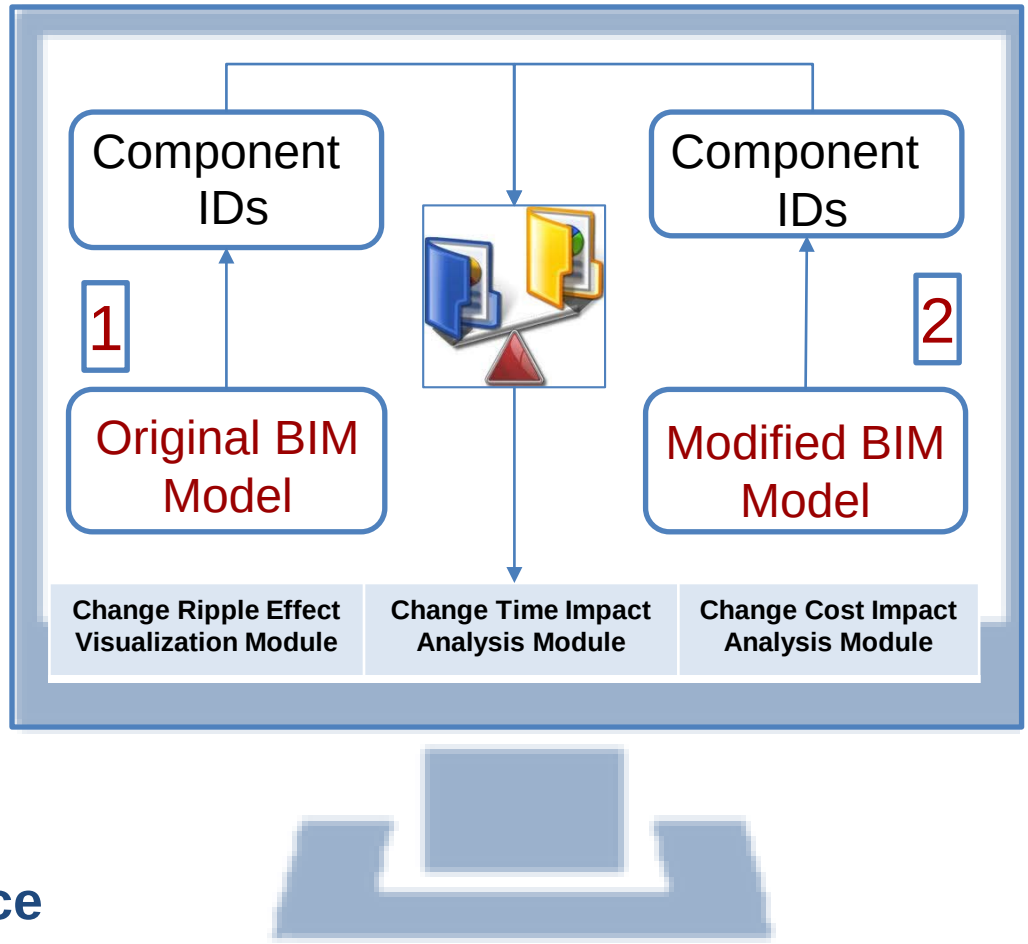


- **Component's Info.**



# Proposed Methodology






- **Main Interface**

# Proposed Methodology

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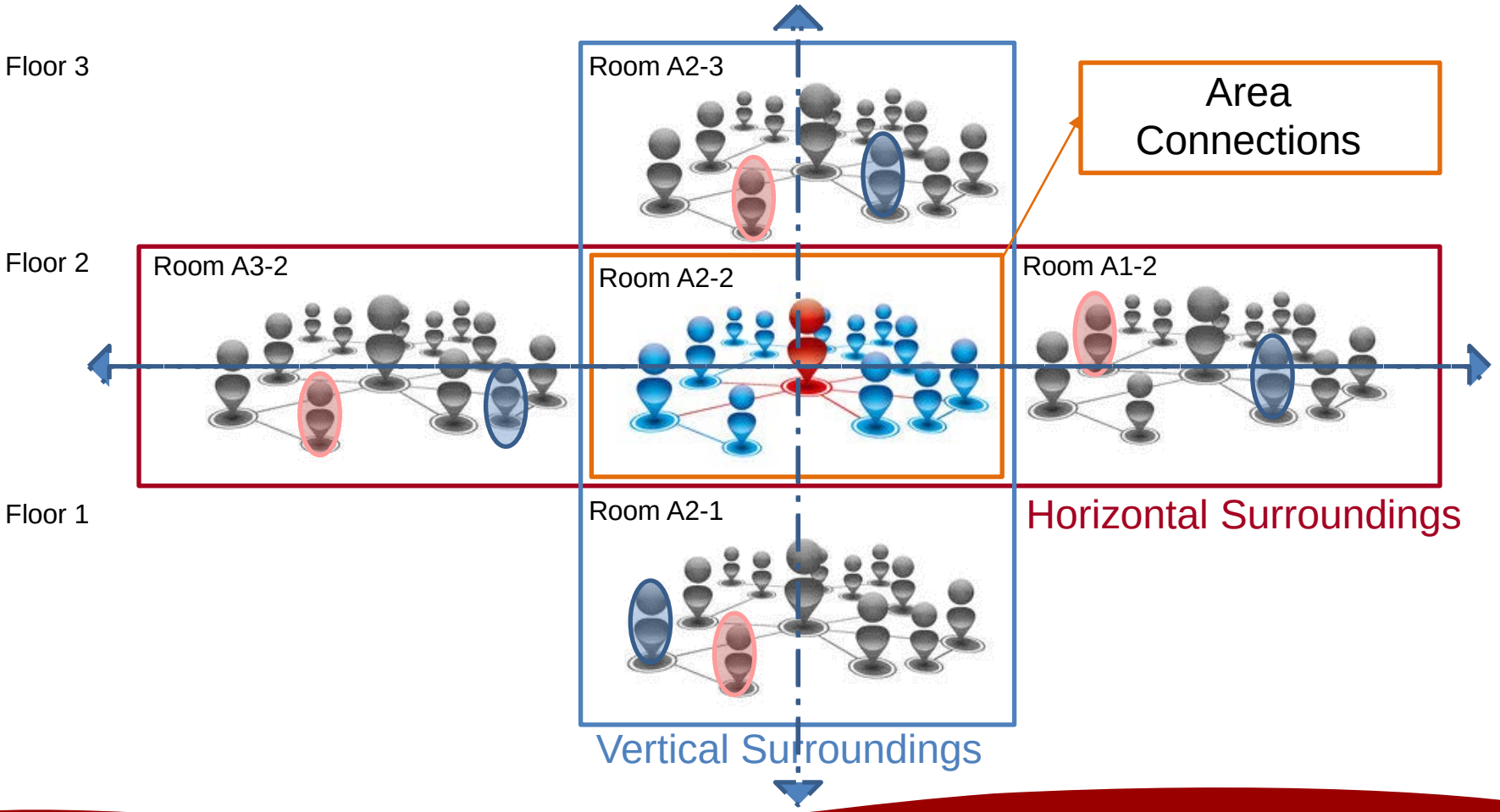
Change Ripple Effect Visualization Module



# Proposed Methodology

| Data Acquisition Framework | Data Analysis Framework | Reporting Framework |
|---|---|---|

## Component ID/name/ Location

| Component ID | Component name | Component location |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

## Original Model

| Original Component Specification | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Geometry | | | Volume | Material | Start date | Finish date | Activity Duration (days) | Cost | |
| L | w | h | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

## Modified Model

| Changed Component Specification | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Geometry | | | Volume | Material | Start date | Finish date | Activity Duration (days | Cost |
| L | w | h | | | | | | |
| | | | | | | | | |
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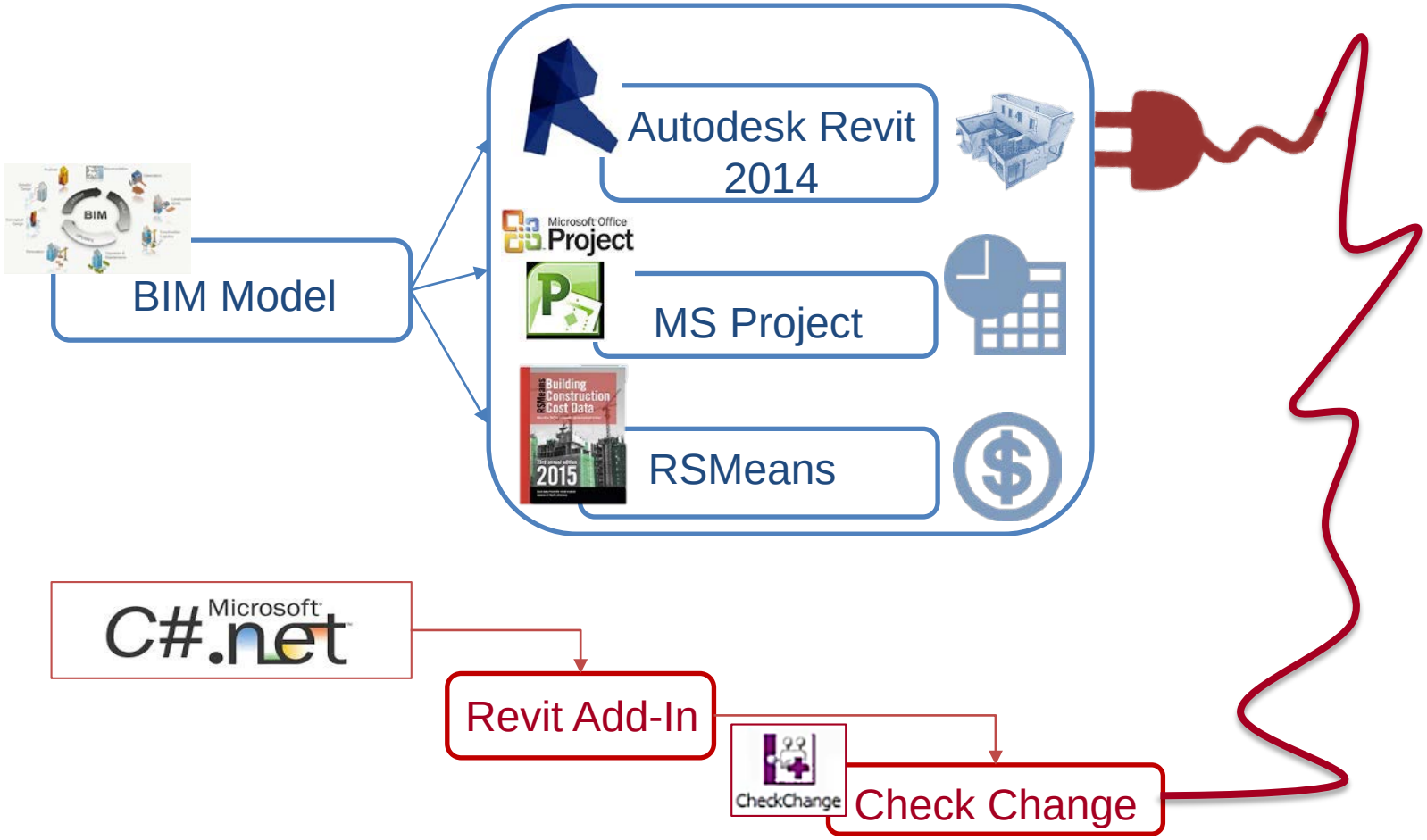
# Preliminary Implementation



# Preliminary Implementation

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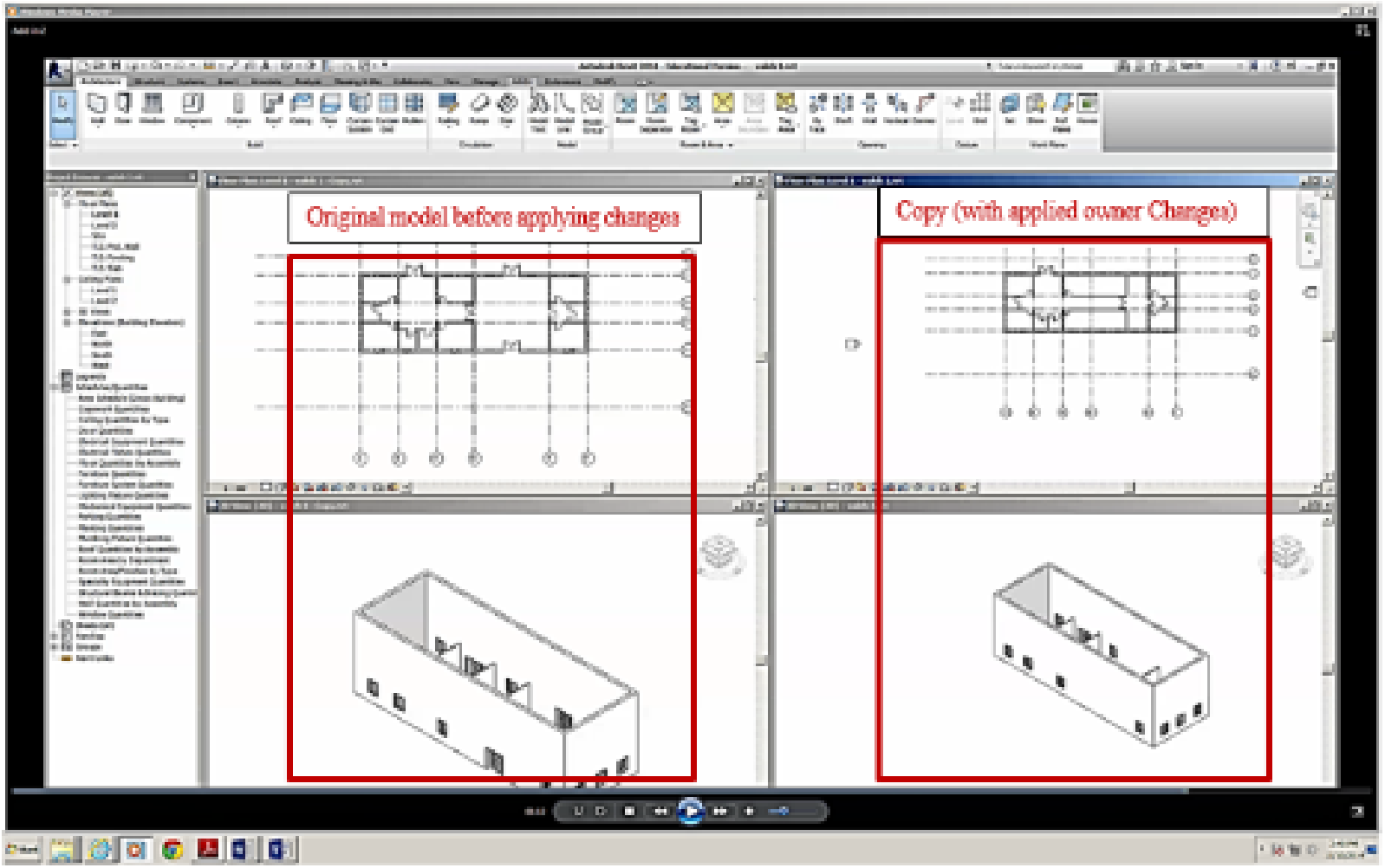

# Preliminary Implementation

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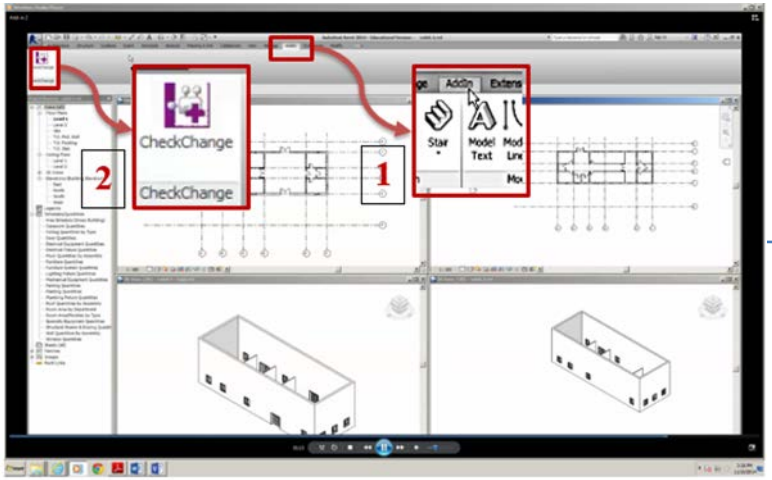
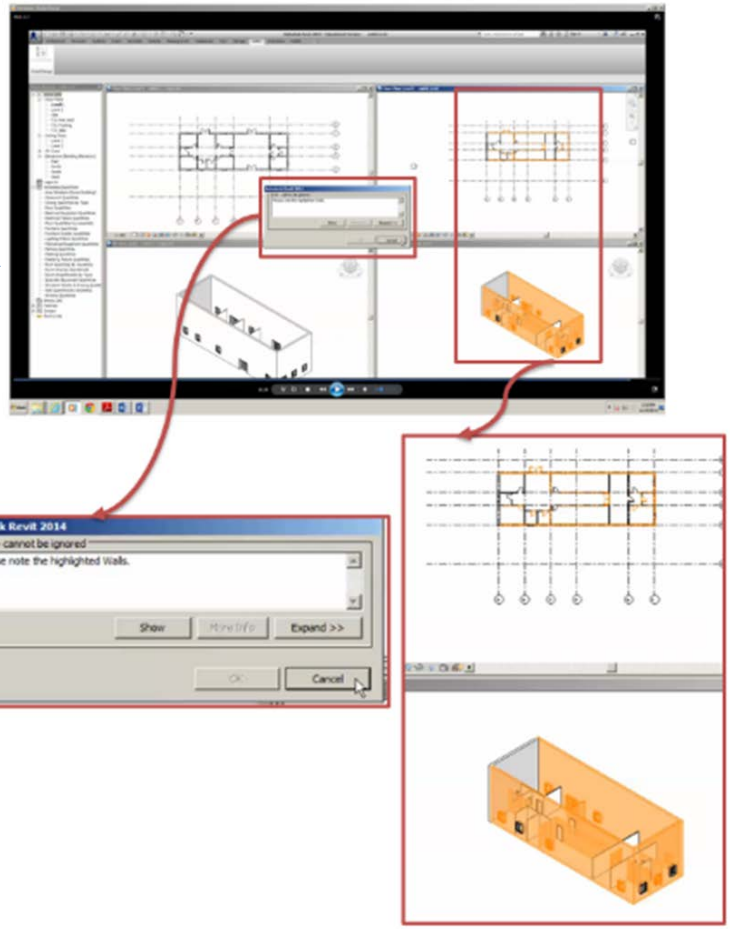
**Change Ripple Effect Visualization Module**



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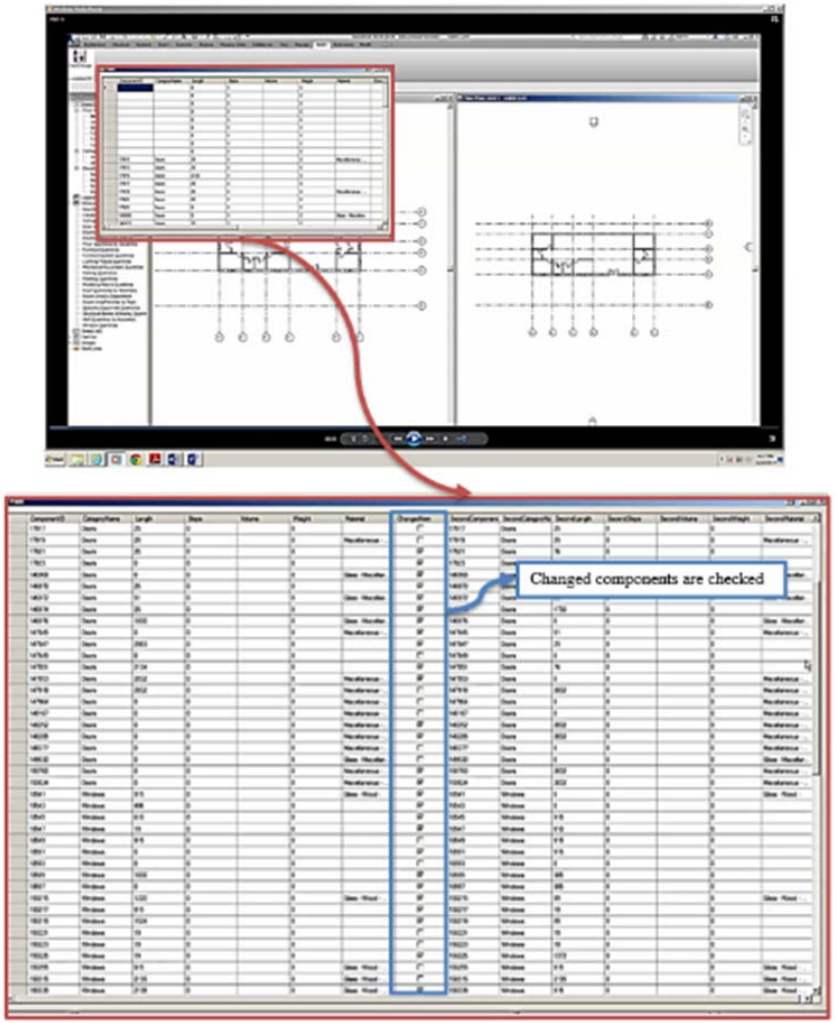

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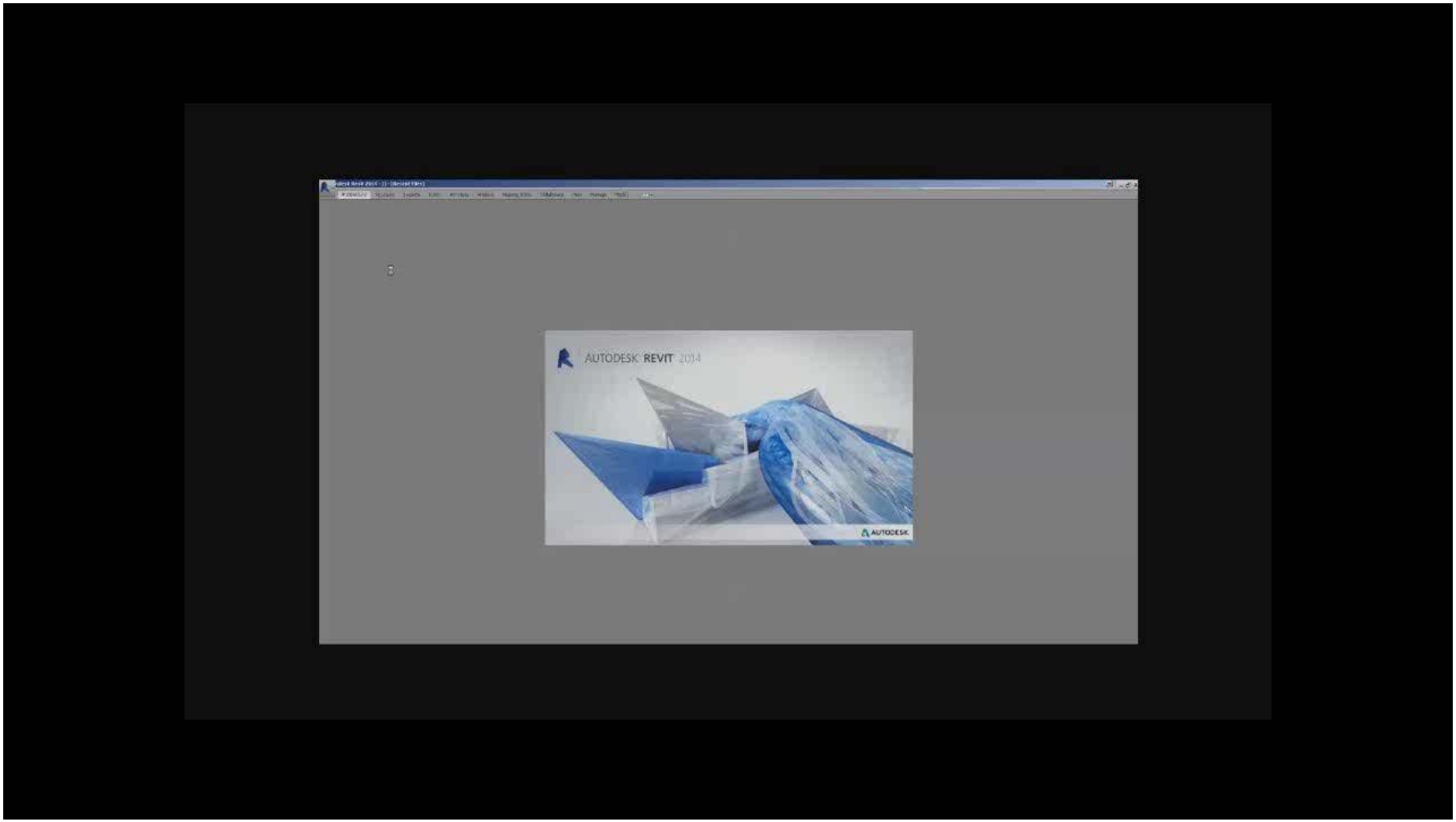

# Observations from the Study

- ✓ A change anywhere can lead to a change everywhere
- ✓ Every design change has a story that matters before owners make final decisions
- ✓ When the change gets visualized, it gets materialized

# Summary and Conclusion

1. Overview of COs Impact
2. Design-change near-real-time ripple effect visualization
3. Development of a system for efficient management of COs

# Questions?

**Thank You for Your Attention!**

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