# Virtual Reality and its Applications in the Mockup Process: A Case Study

Mockups are an important part of the construction process as they provide numerous benefits in both constructability review and aesthetic approval. Virtual Reality is an emerging technology that could prove to be a valuable addition to the mockup process. Many construction firms are attempting to incorporate virtual reality into any process they can -- ranging from impressing owners in order to procure jobs to training employees so they can more adequately adjust to field conditions. This paper will introduce virtual reality and some of its applications in the construction industry, specifically analyzing virtual reality and its applications in the mockup process via a case study. While the projects were met largely with success, they had their share of challenges in implementation. VR mockups proved valuable for aesthetic review purposes. They also improved the design-review process which, in turn, reduced both cost and time. The technology was still met with challenges in implementation. The primary challenges were: aversion to the new technology, illness/nausea, hesitation about increased investment earlier in the project, and the reliance on available technology.

**Key Words:** Virtual Reality, Mock-ups, BIM, Cost/Schedule Comparison, Lessons learned

## Benefits to VR mockups include:
- Speed
- Safety
- Low Cost
- Project Design
- Owner Understanding

## Challenges
Some challenges to implementing VR mockups include:
- Requires new/trained employees
- Technology Aversion
- Sickness/Nausea
- Limitations of the technology
- Reliance on available software

## Software
For this case study we focus on two software options:

<table>
<thead>
<tr>
<th>Software</th>
<th>Unreal Engine</th>
<th>Fuzor</th>
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<tbody>
<tr>
<td>Pros:</td>
<td></td>
<td></td>
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<tr>
<td>High quality finish</td>
<td>Revit model importing</td>
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<tr>
<td>Free software</td>
<td>4D/5D capabilities</td>
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<td>Cons:</td>
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<td></td>
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<tr>
<td>Expensive annual license</td>
<td>Low level of detail</td>
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## Projects
**SFO Hotel: VR vs. Physical**

**New Century Plaza: VR vs. Physical**

## Comparision

| Traditional Mockup: | Schedule: 3 months - construction ~10 Months including coordination |
|                     | Cost: 2 room + hallway mockup - $600,000+ |

<table>
<thead>
<tr>
<th>Virtual Reality Mockup:</th>
<th>Schedule: 2-3 Weeks - production ~2 Months including coordination</th>
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<tr>
<td>Cost:</td>
<td>2 room + hallway mockup - $3,000-$5,000 Plus Fixed hardware and licence costs</td>
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## Virtual Reality
Emerging technology which allows you to visualize a model better, in construction its uses include:
- Training
- Coordination
- QA/QC
- Marketing/Procurement
- Mockups

## VR Mockups
What does a VR Mockup Offer thats New?
- Pre-Mockup mockup
- Unintended/intended sightlines
- "Feel" the sizes and finishes of areas
- Lower cost & schedule than traditional mockups
- Pre-aesthetic review - Reduce rejected materials

## Ask About The VR Demo!

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## Traditional Mockups
Scale or full-size model of a design or device, used for:
- Aesthetic Review
- Constructability Review
- Assembly Testing
- Demonstration
- Selling a product