SCHEDULE OPTIMIZATION OF A LARGE HOSPITAL PROJECT

4D BIM starting with the demolition

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Main Points

1. Background
2. Literature review
3. Methodology
4. Context of the project
5. Design of a production control system
6. Evaluation of the artefact
7. Discussion & future work
Background

- The situation in the construction industry
- BIM – productivity and performance optimization
- Key enabler for many other technologies
- Lean provides the strategies

www.slideshare.net/Jchesnut/airventure-2009-biofuels-presentation-1826087
Literature review

BIM & Lean interaction

• Matrix, based on case studies:

• Evaluated the relations between 24 Lean Construction principles and 18 BIM functionalities

• Applicable for deconstruction: synergies between the BIM functionality of rapid simulation & evaluation of deconstruction alternatives

BIM for deconstruction & demolition

• 4D-BIM - visualisation of the deconstruction scheduling

• Minimize the waste during demolition

• Reduce the cost of deconstruction

• Maximize recycling

Sacks et al. (2010, 2018); Elmaraghy et al. (2018)  
Ge et al. (2017), Schultmann & Rentz (2002), (Akinade et al. 2017)
Literature review

Production system & scheduling

- Work Structuring
- Location Breakdown Structure
- Last Planner™ System
- Line of Balance
- Flowline
- Takt-Time Plan
- All Activities Critical Planning (ACP)

Ballard (2000); (Kenley and Seppänen 2009); (Frandsen et al. 2014); Melzner (2019); (Bernardes 2003); (Ghio et al. 1997).
Methodology
Design Science Research (DSR)
The case study

A mega-hospital project (420M$)
Second phase of a large hospital complex
Dense urban area.

Three new buildings – two above-ground blocks of around 17 storeys, amphitheater and 8 floors of underground parking garage

The new development - on the place of an existing big hospital, which had to be demolished

PPP

Integrated BIM-VDC & Lean used extensively
The production control system
## The artefact - details

### Démolition architecturale intérieure - Aile CENTRE

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### Équipes

- Cabanage
- Démolition amianté (mur/plafond)
- Nettoyage/collage
- Désamiantage
- Dégaminage (Materiels dangereux/plafond/poutre/Médeite hot)
- Démolition Mur intérieur
- Démolition équipement/Mécanique
- Préparation salle mécanique
- Désamiantage - Risque Faible (Tuilerie)
- Désamiantage- Risque modéré (Tuilerie ou Tuilerie et murs)

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<tr>
<th>Équipe</th>
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<th>Demo 2 et Demo 3</th>
<th>Prep salle mec</th>
<th>Amiante 2</th>
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The artefact - details
Integrated BIM & Lean

Collaborative scheduling

Master schedule

ACP Planning

Pull Planning

Conception

Approvisionnement

Construction

Tool box meeting

Collaborative scheduling

PULL

PULL

PULL

11
Integrated sequencing + 4D
APPRECIATION of the ARTEFACT
Generalization of the artefact

Planning Methodology

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<tr>
<th>Master Schedule</th>
<th>Phase Schedule</th>
<th>3 Weeks Look Ahead</th>
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<tr>
<td><strong>Structuring of Construction Master Schedule</strong></td>
<td><strong>Structuring of Construction Phase Schedule</strong></td>
<td><strong>Structuring 3 Weeks Look Ahead Schedule</strong></td>
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<td>Takt Planning</td>
<td>Pull planning</td>
<td>Location, Breakdown, Structure (LBS)</td>
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<td>CPM planning</td>
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<td>Location, Breakdown, Structure (LBS)</td>
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<td>Design Master Schedule</td>
<td>Design Schedule</td>
<td>Pull planning</td>
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<td>Procurement Master Schedule</td>
<td>Procurement Schedule</td>
<td>Pull planning</td>
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**(-) LEVEL OF DETAIL (+)**

- Sub contracts
- Design
- Procurement
- Site location and access
- Permits
- Client
- Market
- Enterprise strategy
- Design phase
- Schedule
## Evaluation & Discussion

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<th>Key Points</th>
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| • Appreciation of the team  
  • The preferred representation of the schedule by superintendent and foremen |
| • Impact on the project timeline  
  • 2 months reduction of the timeline |
| • Use on 20 other projects since |
| • Partial demonstration of the ‘Simple Framework for Project Delivery’ (Fischer et al 2014) |
| • The integrated BIM/VDC/Lean platform – promotes Lean culture on the construction site |
| • Trust in the Innovation Team |
Thank you!

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