Smart Reconstructing RADBOUD NIJMEGEN

Smart construction logistics
the case of a large Dutch inner city hospital and university

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Radboud: green location in a city centre
Timeline of construction plans
Roles of partners in this research project

- Research contractor: Connekt – PPP – intends to stimulate smart construction logistics, as part of its Zero Emission policy programme, together with the Dutch National Topsector Logistics.

- Researchers: Kennis DC Logistics Gelderland (institution) and Kennis DC Logistics Amsterdam - they develop and disseminate knowledge on smart construction logistics, and assist Radboud with an applied advice:

- Research Question: In logistic terms, how best to organise the complex (re-) building of 13 sites of Radboud in Nijmegen?
  - Which logistics concepts do apply?
National coverage - 6 nodes; 9 partners; many supporters from Governments, Knowledge institutions and Business
Regional priorities and specialisations

- Knowledge DC Limburg
  - Customs / Trade, Synchro-modality, E-commerce, VAL/VAS, Agro Logistics

- Knowledge DC Gelderland
  - FMCG, Health Care logistics, Human Capital

- Knowledge DC Zeeland / Brabant
  - Physical distribution & warehousing, Event logistics, Service & Maintenance

- Knowledge DC Zuid-Holland
  - Port logistics, City Logistics, Service logistics

- Knowledge DC North East
  - ‘Supply Chain Finance’ and ‘Logistic nodes / inter-regional networks’

- Knowledge DC Amsterdam
  - Mainport logistics and City logistics
In logistic terms, how best to organise the complex (re-) building of 13 sites of Radboud in Nijmegen? Which logistics concepts do apply?

- Inventarisation of smart construction logistics concepts
- Obtained results of applied smart construction logistics concepts
- Characteristics of Radboud
- Synthesis: which concepts have most potential for Radboud?
A selection of relevant construction logistics concepts

- A construction consolidation centre (buffer in time and place, facilitates other concepts)
- Prefabrication (saves space and time),
- Construction logistics tickets (regulates traffic to, from and on the construction site)
- Shuttle service for employees (regulates traffic and saves parking space)
- Construction logistics coordinator (realize mentioned above through a smart planning).
- Monitoring through KPI's (continuous improvement)
- EMAT criteria (economic most profitable procurement conditions)

- On the level of the logistics chain
- On the level of production
- On the level of logistics tactics
- On the level of logistics tactics
- On the level of logistics management
- On the level of logistics management
- On the level of procurement
The construction logistics concept: Construction consolidation centre

- the CCC (or hub) is a buffer in time and place
- it facilitates other concepts
A selection of relevant construction logistics concepts

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Prefabrication is also safer!
# Results of smart construction logistics

## Construction Consolidation Centre London
- + 95% Delivery reliability
- + 25% Safety
- + 47% Productivity
- - 68% Transport movements to the site
- - 15% Decrease of waste
- - 75% CO2 reduction

## Construction Consolidation Centre Amsterdam Amstelkwartier & de Trip
- + 45% Productivity
- + 50% Loading capacity
- - 18% Kilometres travelled
- - 54% Construction Freight in city centre
- - 23% CO2 emissions
- - 0.8% Budget
- - 40% Delivery time
# Features Radboud

<table>
<thead>
<tr>
<th>Feature</th>
<th>Implications for construction logistics</th>
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<tbody>
<tr>
<td>In city centre</td>
<td>Little space on the construction site, busy traffic: smart construction logistics necessary</td>
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<tr>
<td>Many visitors</td>
<td>Must remain (relatively) accessible and safe; separation of traffic flows (pedestrians/cyclists/cars):</td>
</tr>
<tr>
<td></td>
<td>smart construction logistics necessary</td>
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<tr>
<td>Ambulance traffic</td>
<td>Must remain fully accessible: smart construction logistics necessary</td>
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<tr>
<td>Will take several years</td>
<td>Must remain fully accessible: smart construction logistics necessary</td>
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<tr>
<td></td>
<td>Investment in good construction logistics possible</td>
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<tr>
<td>Will take several years</td>
<td>Monitoring by means of KPIs will allow for interim improvements</td>
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<tr>
<td>Major financial investment</td>
<td>Investment in good construction logistics possible</td>
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<tr>
<td>Technology develops rapidly</td>
<td>Construction plans to remain flexible</td>
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<tr>
<td>Two project managers (university and</td>
<td>Coordination required</td>
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<tr>
<td>hospital)</td>
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<tr>
<td>Available sites nearby</td>
<td>Construction logistics hub possible</td>
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<td>Willingness to make use of smart</td>
<td>Support required in design of logistics and stakeholder management; follow-up research necessary</td>
</tr>
<tr>
<td>construction logistics concepts</td>
<td>Investment in good construction logistics possible</td>
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Establish the hub in combination with:

- prefabrication (to save time and space)
- a ticketing system (to regulate traffic to, from and on the construction site)
- a shuttle service for employees (to regulate traffic and save parking space)
- a construction logistics coordinator (to ensure that the above benefits are realised by means of smart planning)
- monitoring of the construction process by means of KPIs (to learn from and improve on previous experiences).

Support in development and stakeholder management
Conditions for success

Stakeholders do have to be prepared to change roles – in order to create win-wins!

It really will help when:

- the client (Radboud) obliges the contractors to integrate a hub in its tender proposals, and evaluates all contractors’ proposals on the existence of a hub plan, on the basis of EMAT criteria (in addition to other criteria);

- the main contractors establish a logistical concept that not only is optimal for themselves, but also incorporates all main subcontractors and suppliers, while sharing costs and benefits equally between each others;

- the subcontractors, suppliers and hauliers all actively choose to cooperate within the new common way of working;

- the municipality provides a site for the hub, stimulates preferred routes between the hub and the construction site, lays down requirements for vehicles in the building permits, lays down conditions in the environmental local permits, and so on.
Conclusions

- A lot of opportunities do exist for smart organising the complex (re-) building of 13 sites of Radboud in Nijmegen
- Enormous wins can be gained – especially when combining different construction logistics concepts
- The big challenge remains: how to develop construction logistics in such a extremely fragmented branche of industry, into a coördinated construction demand chain?