



Lean renovation – a case study of productivity, Flow, and Time improvements

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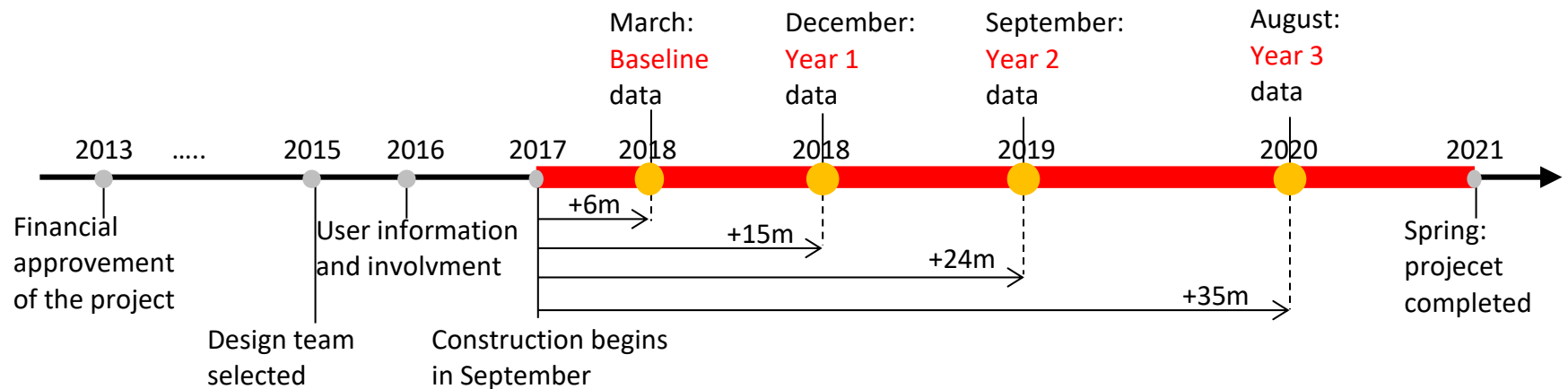
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DATA COLLECTION METHOD

- A single-case
- Typical renovation case
- Primary data: Quantitative, Work Sampling
- Secondary data: Unstructured qualitative data, observations, interviews, etc.
- Work Sampling, a well know approach to efficiency (DW)



THE CASE



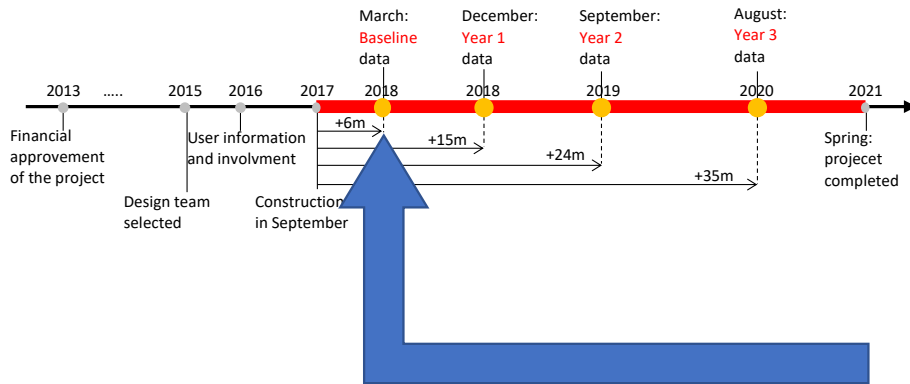
WORK DESCRIPTION

Each block is renovated - overall description of process and work:

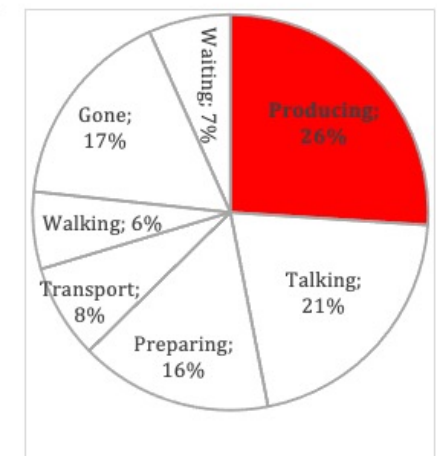
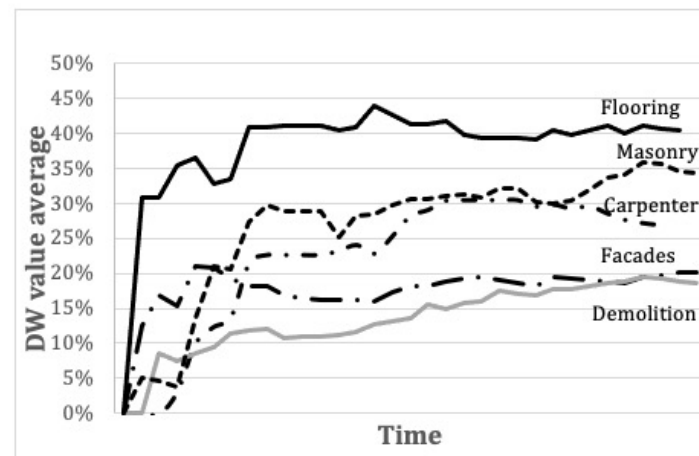
1. Tenants are relocated temporarily.
2. Demolition of all non-structural elements indoor and outdoor.
3. Establishing new elevator shafts and additional steel reinforcements.
4. The façade and roof are changed.
5. Masonry works are conducted. New internal walls etc
6. Installations and electrical work, including new wiring, new pipes, new heating, new ventilation, new bathroom, and new kitchen
7. Carpenter internal works, in the form of walls, ceilings, etc.
8. Masonry works in bathrooms, including titles, sink, toilets, etc.
9. Plastering and paintwork.
10. Flooring in all rooms and installation of new kitchens.
11. Completion, correction, and approval by the client.
12. Tenants move back and work moves on to the next block.



BASELINE – NO LEAN IMPLEMENTED

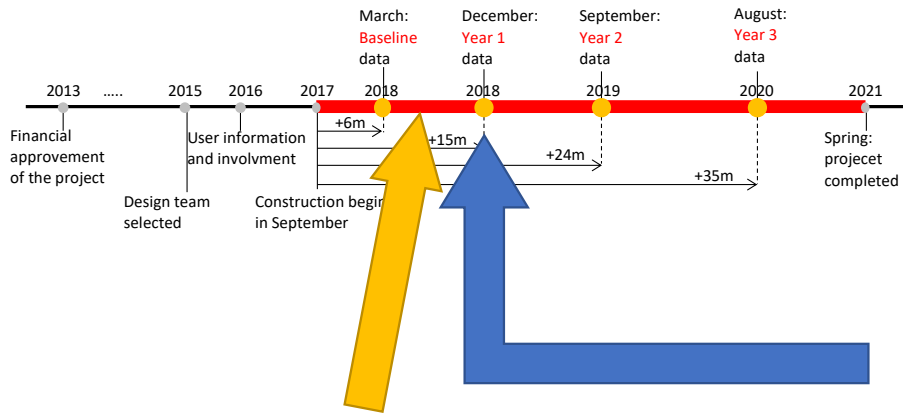


	Direct Work	Indirect Work	Waste Work				
\bar{p} (%)	26.0%	44.4%	29.6%				
n	7,777	13,257	8,850				
	Producing	Talking	Preparing	Transport	Walking	Waiting	Gone
\bar{p} (%)	26.0%	20.9%	15.7%	7.7%	6.3%	6.7%	16.6%



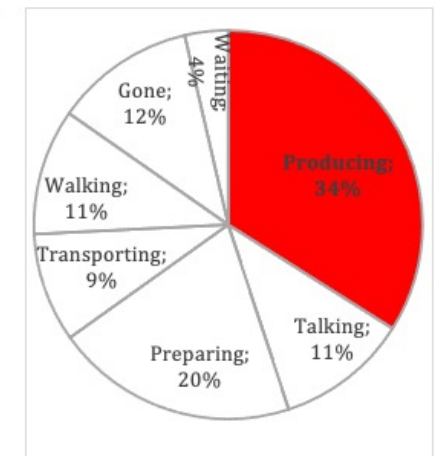
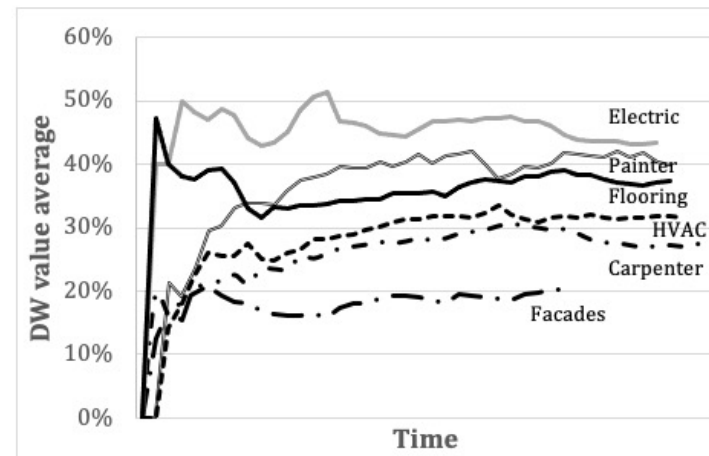


YEAR 1 – LAST PLANNER SYSTEM™ IMPLEMENTED



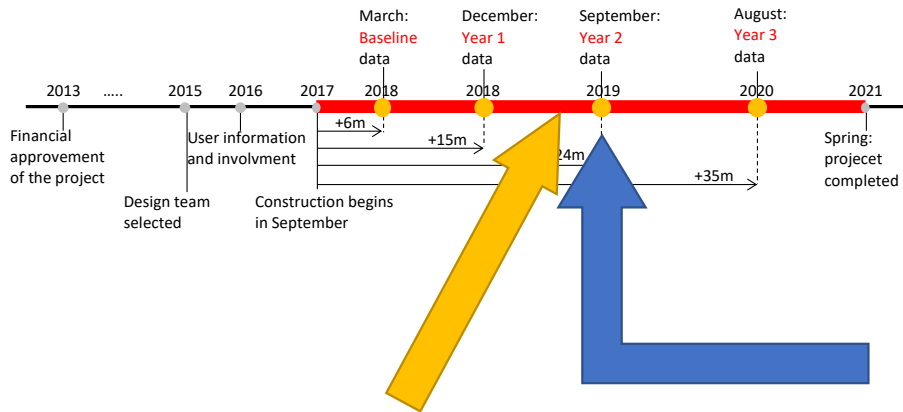
	Direct Work	Indirect Work	Waste Work				
\bar{p} (%)	34.0%	40.2%	25.8%				
n	1,534	1,813	1,160				
	Producing	Talking	Preparing	Transport	Walking	Waiting	Gone
\bar{p} (%)	34.0%	11.0%	20.2%	9.1%	10.5%	3.6%	11.7%

- LPS partially implemented
 - no process planning
 - No PPC follow-up
- Daily huddles implemented
 - Forman and crew on location
 - Weekly whiteboard meetings



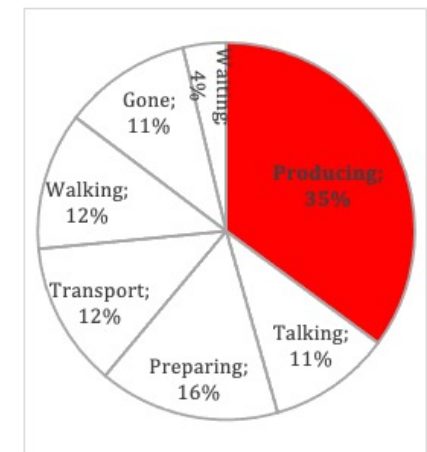
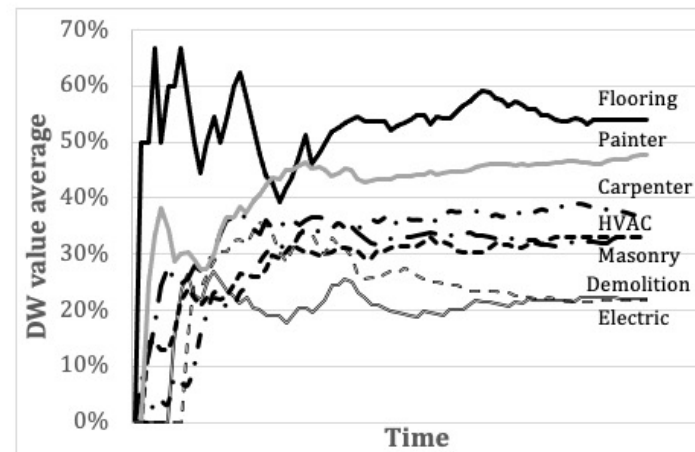


YEAR 2 – LOCATION-BASED SCHEDULING IMPLEMENTED



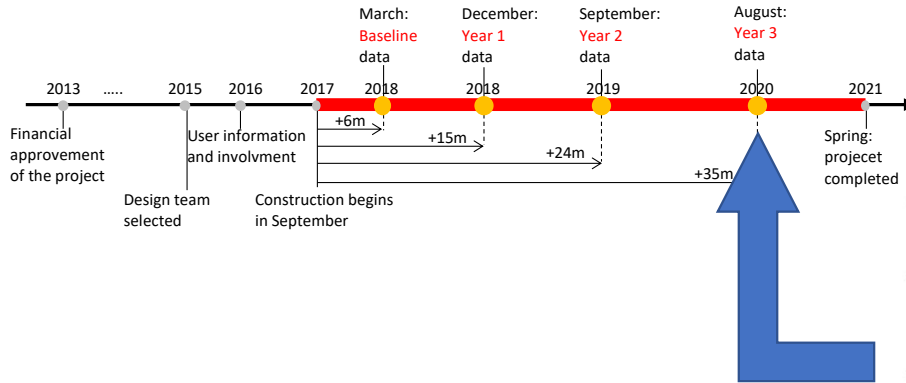
	Direct Work	Indirect Work		Waste Work			
\bar{p} (%)	35.1%	38.4%		26.5%			
n	664	725		502			
	Producing	Talking	Preparing	Transport	Walking	Waiting	Gone
\bar{p} (%)	35.1%	10.5%	15.5%	12.4%	11.8%	3.7%	11.0%

- LBS was implemented
 - Main scheduling method
 - Master schedule still Gannt
- Visible site management
 - Especially during start-up in the mornings



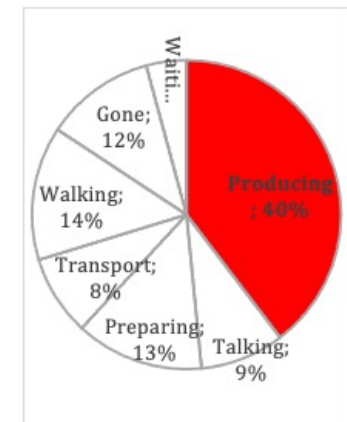
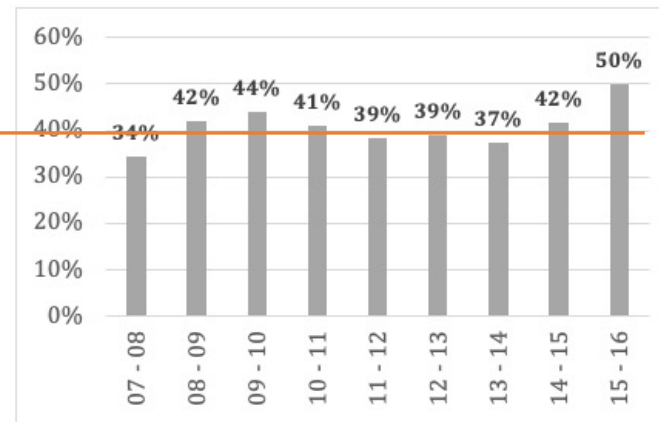


YEAR 3 – ANCHORING

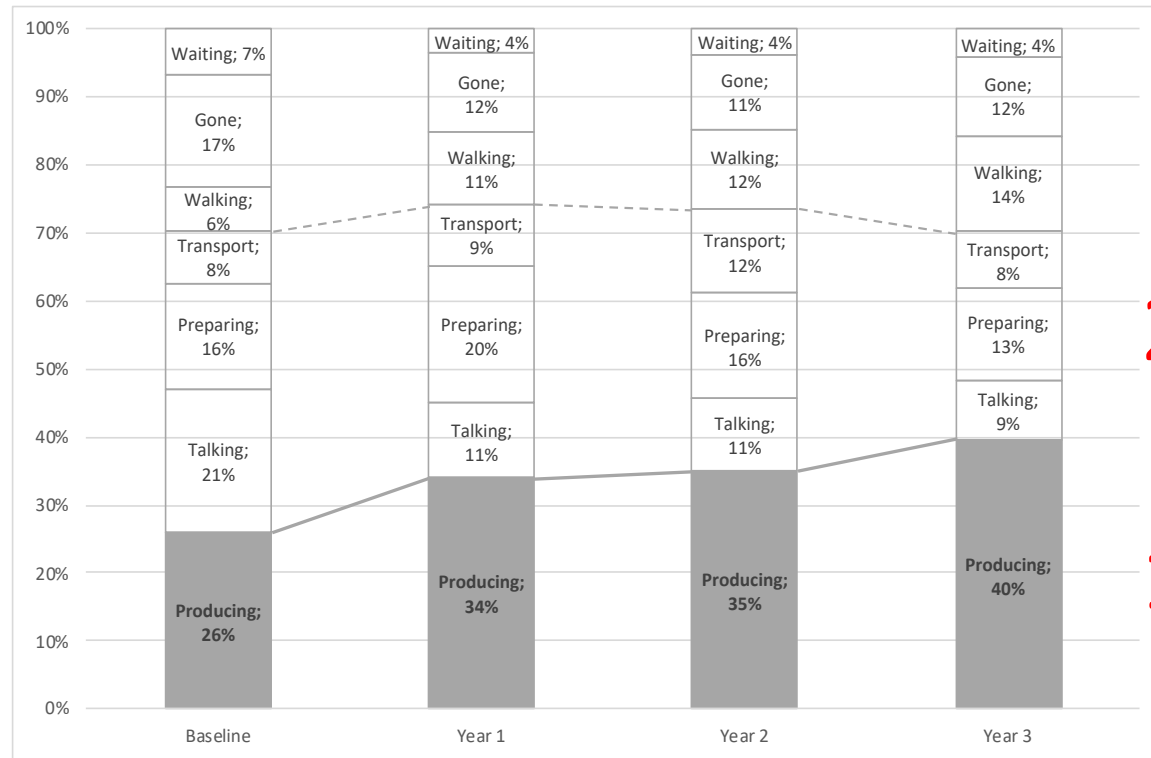


	Direct Work	Indirect Work	Waste Work				
\bar{p} (%)	39.6%	30.6%	29.8%				
n	565	436	424				
	Producing	Talking	Preparing	Transport	Walking	Waiting	Gone
\bar{p} (%)	39.6%	8.8%	13.4%	8.4%	14.0%	4.2%	11.5%

- Stable work flow during the day



CONCLUSION



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THANK YOU!

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