Aalto University
School of Engineering

Operation Management in Construction
Lecture #5 Takt planning and takt control

Topics

- **Learning objectives of Lecture #5**
- **Takt planning overview and differences to LBMS**

Intended learning objectives for this lecture

- ILO 2: **Students can compare and contrast** the similarities and differences of different production planning and control methods
  - *ILO emphasized for takt*
- ILO 5**: Students can explain** the significance of work and labor flow and how flow can be achieved in construction
  - *ILO continued*
- ILO 9**: Students can analyze** the quality of a location-based schedule
  - ILO continued

What is takt?

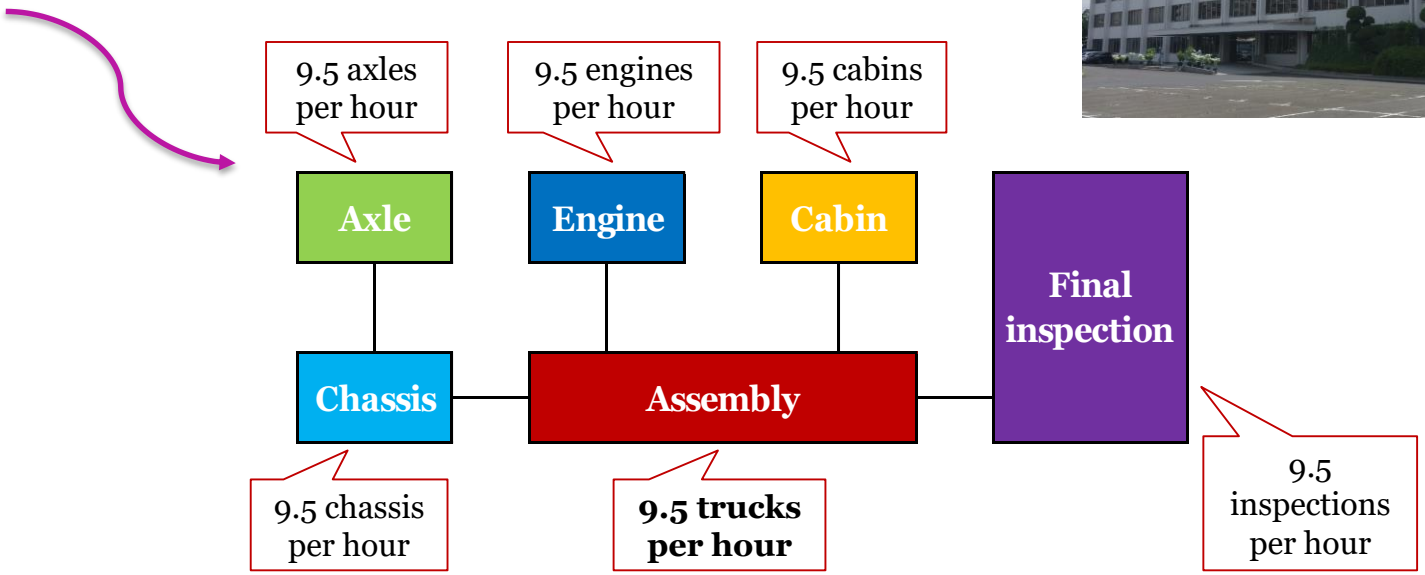
- The origin of word ”takt” is in latin, ”tactus”: touch, feeling (Haghsheno et al. 2016)

- German word ”takt” means ”rhythm” or ”cadence” (Frandson et al. 2013)

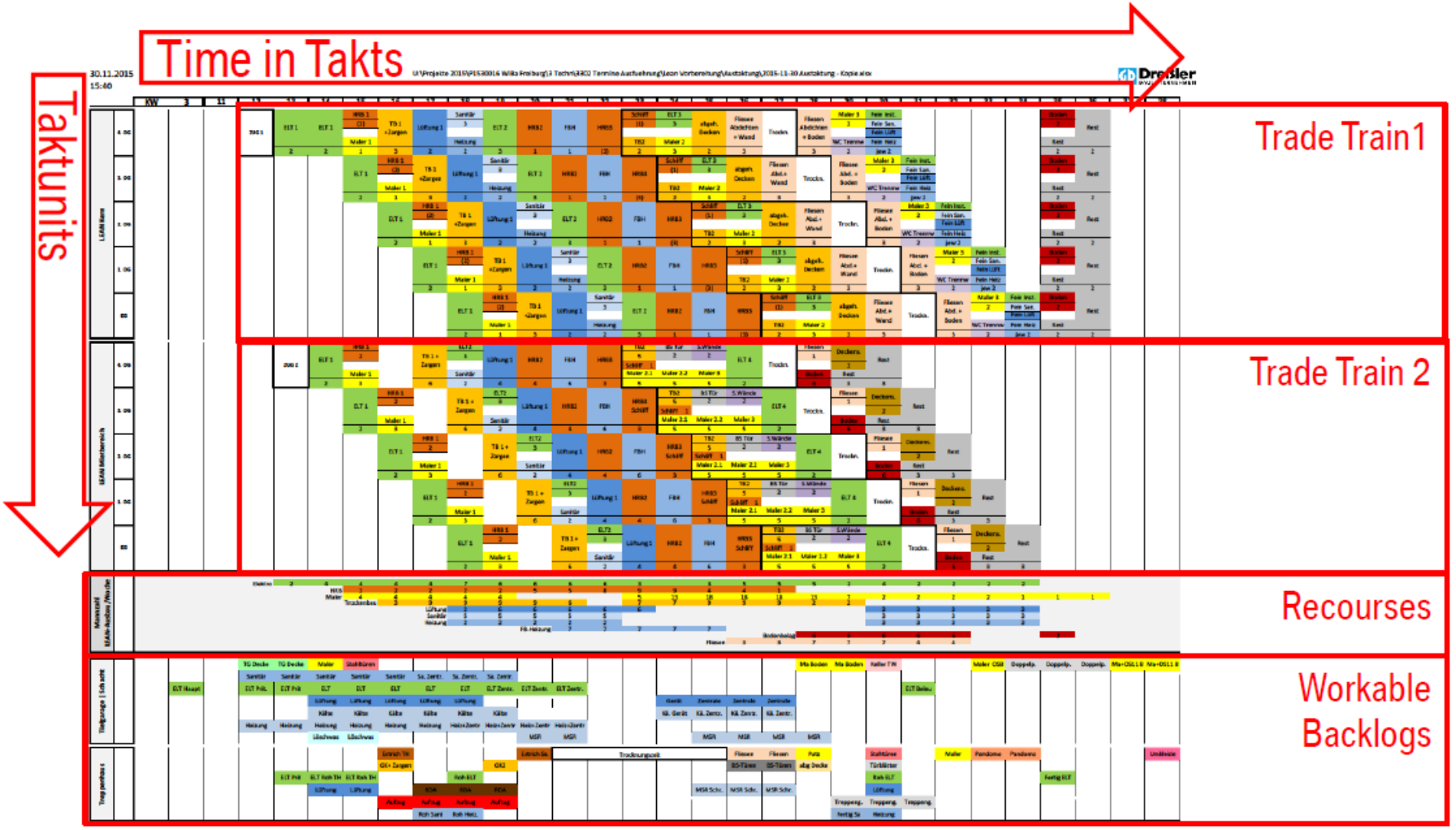
- *Takt time is a unit of time, when a product must be completed (supply rate), in order to match the rate of demand (demand rate).* (Hopp and Spearman 2008)

- Takt has been used in **manufacturing** since 1800s (e.g. Ford 1913)

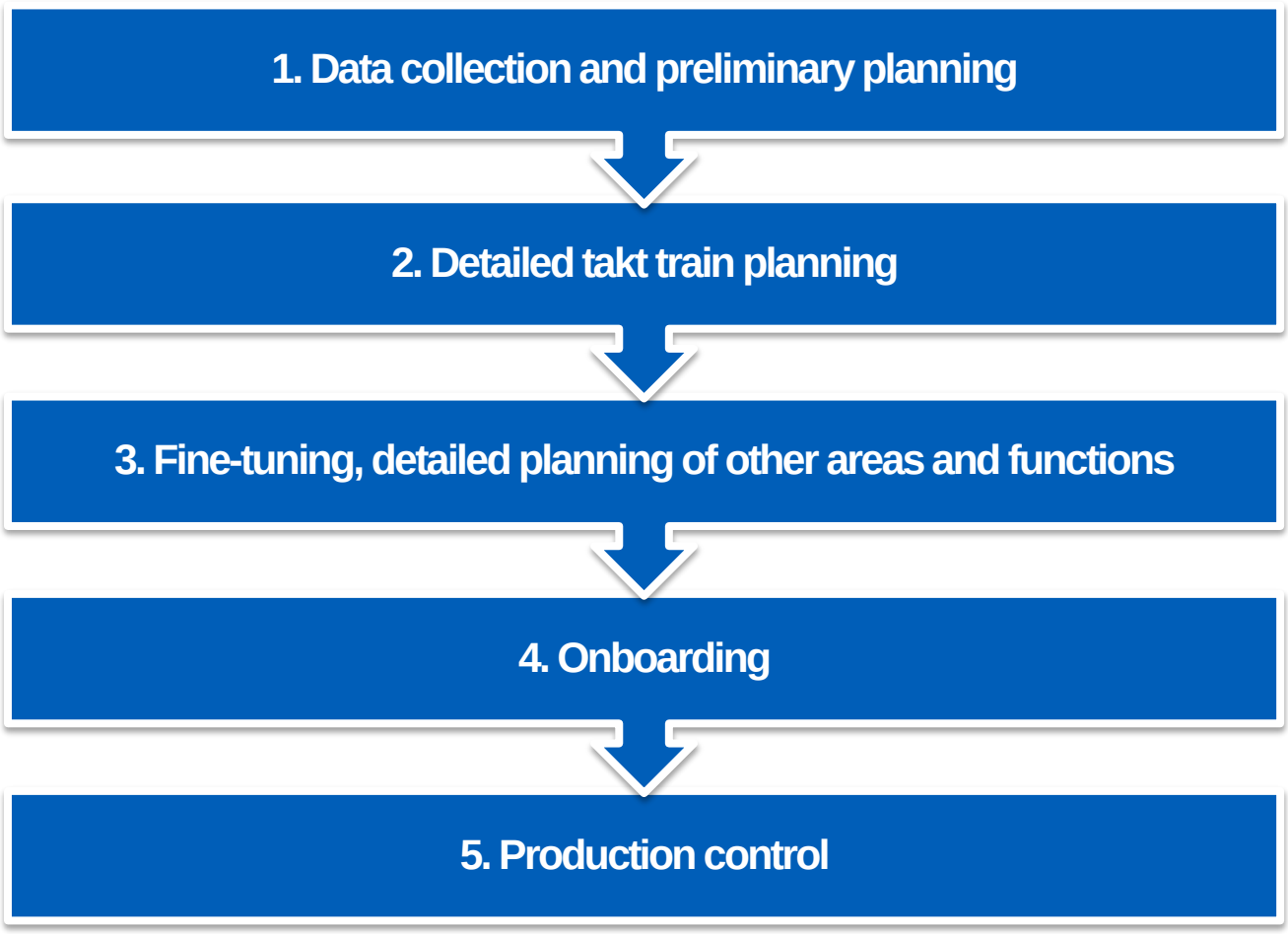
- In manufacturing, takt is typically in **minutes or hours.** (e.g. Mitsubishi factory in Japan produces 9.5 trucks per hour)



Simple takt schedule



Takt production design



1. Data collection and preliminary planning

- Define the overall scope: client's needs, master schedule milestones etc.
- Data collection from different sources:
  - *Master schedule (milestones)*
  - *2D drawings / 3D models (quantities)*
  - *RATU (theoretical durations)*
  - *Subcontractors resources, capabilities & preferences*
- Based on the information, define the basic production flow, functional areas

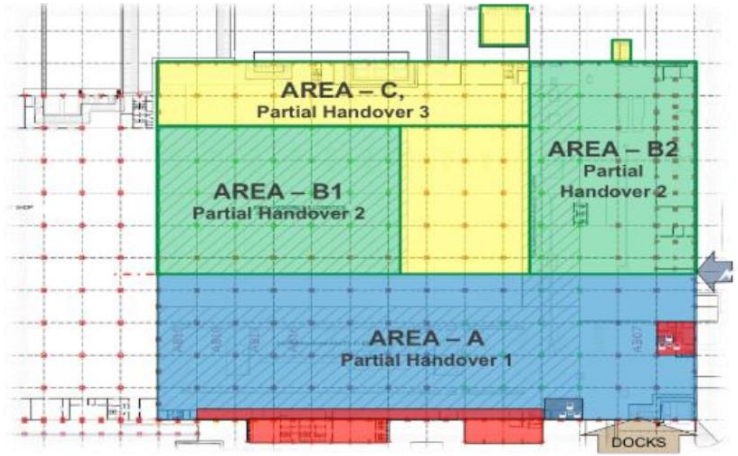


Figure 4: Categorization of customer's spatial area prioritization

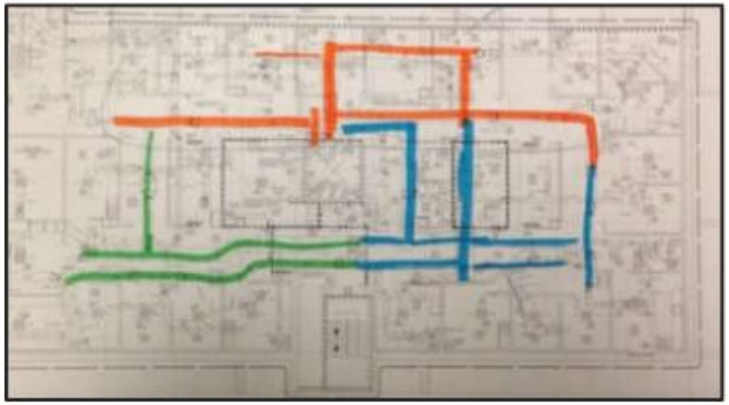


Figure 3: Input from Mechanical Trade using Work Chunks of 2-Day Takt, Sequenced Orange, Blue, then Green

2. Detailed takt train planning

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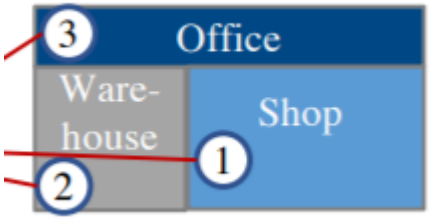
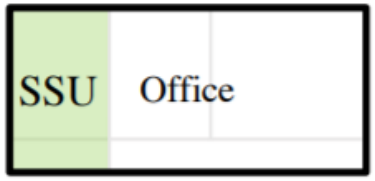
1. Pick one functional area



2. Define takt areas for one functional area



3. Define work packages for every takt area

2. Detailed takt train planning

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4. Do the calculation of the amount of work for every step

5. Allocate detailed works steps to work packages

6. Determine takt time

2. Detailed takt train planning

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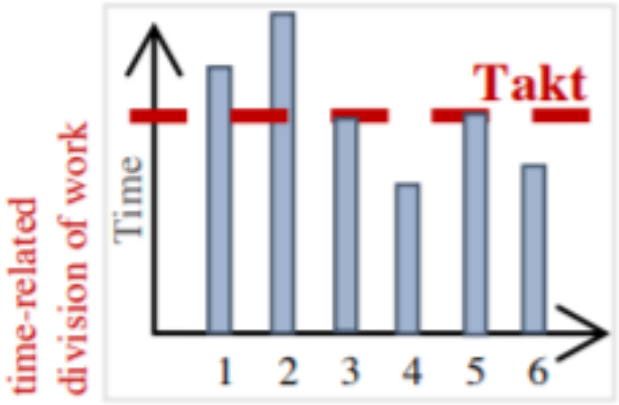
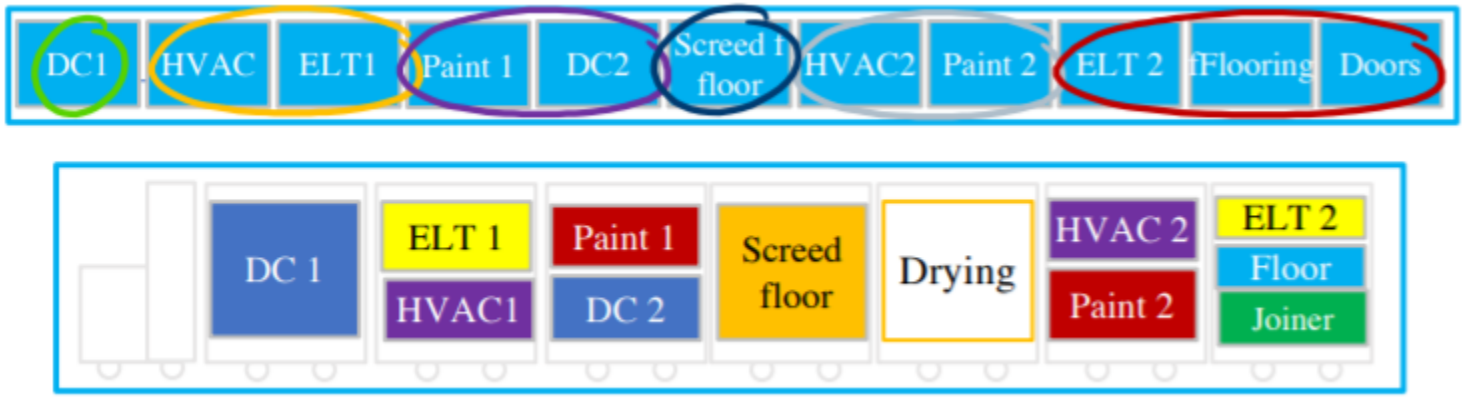
7. Takt levelling:
   - shifting variable work steps
   - variation of manpower
   - duplication of wagons
   - buffer, etc.



8. Combine the work packages best for determined takt time & area



2. Detailed takt area planning

- Iterate steps 1-8 for balance and mutual agreement
  - *Integrate logistics planning, material suppliers, design management, key subs*
  - *Subcontractors need to understand the logic and agree with the schedule!*

3. Fine-tuning, detailed planning of other areas and functions

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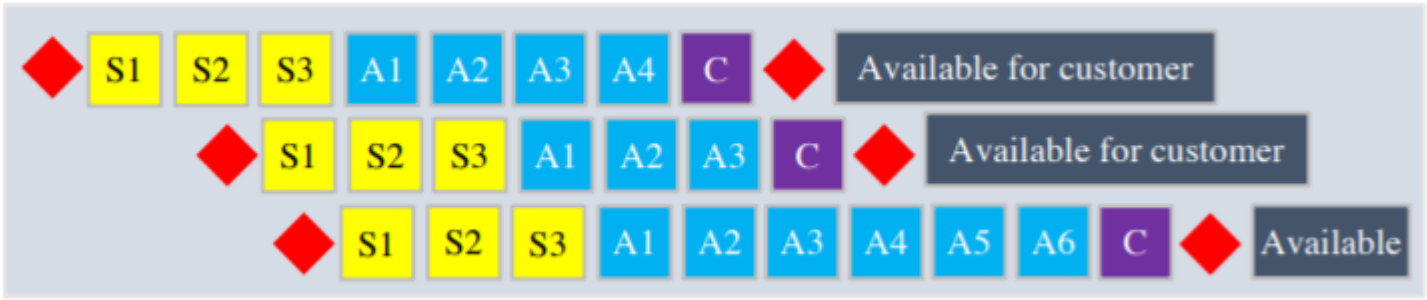
9. Repeat for all functional areas

10. Finish the schedule by adding areas outside of takt, define backlog areas

11. Fit the schedule to meet the fundamental flow and milestones



4. Onboarding

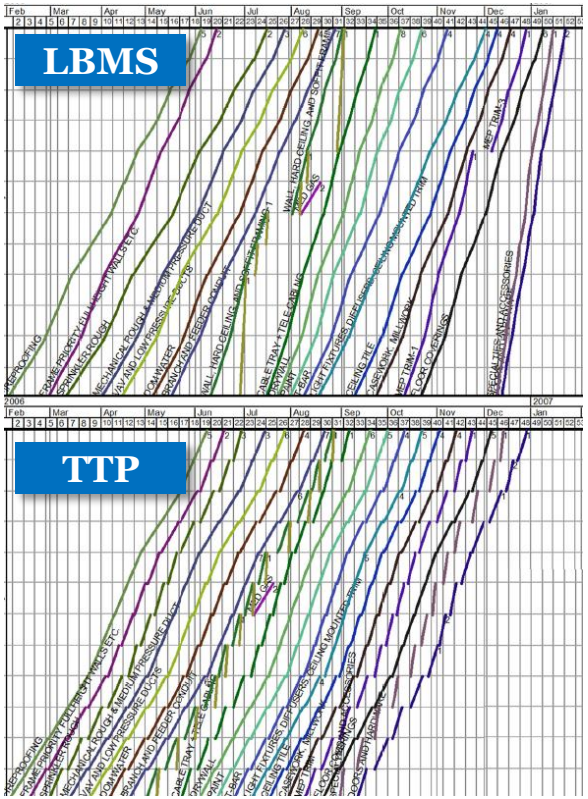
- Organize the phase handover, and plan soft start with lower utilization rate on the first takts

- Check the final design solutions, and coordinate the details of the logistics plan with the workers

5. Production control

- Daily huddles: 5-10 minute discussion in the morning
  - *What has been done*
  - *What are we doing today*
  - *Do we everything set to perform the work today?*
  - *Visual management with control boards*
- Systematic quality control and handoffs between wagons
- Continuous data collection, problem solving and improvement

Comparison between LBMS and TTP



Seppänen (2014)

	LBMS	TTP
Similarities	1. Aim for continuous flow of work through production areas at a set beat for each phase of work 2. Use the ability to trade scope in order to improve the production system	
Buffers: time, capacity, space and plan	Time is the preferred buffer, but space is also used	Capacity is the preferred buffer, accomplished through underloading
Controlling	Top down approach: tracking progress, running forecasts, and identifying problems that are then solved collaboratively	Visual workplace to make clear to all, who is doing work, and where, in order to distribute control
Resources	Fully load resources on production tasks and use the same crew size continuously	Underload crews on production tasks in order to maintain a timely, predictable hand off

Frandson, Seppänen & Tommelein (2015)

Thank you
Questions & Comments