Times: cycle, lead, takt

Problem
How to determine if a process is fast enough?

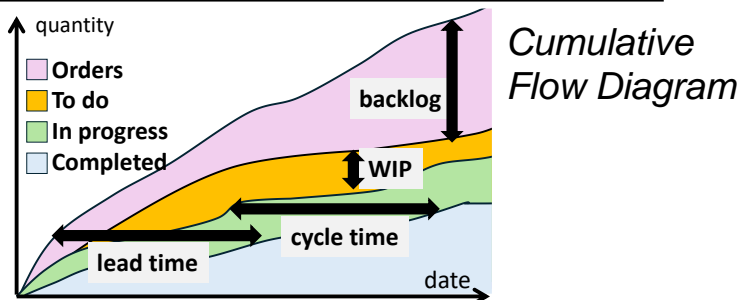**Difficulty**

Easy to use

- **Cycle time:** the time taken from start to finish of a task, including loading or unloading of materials, etc.
- **Lead time:** the total time taken from order initiation until its completion, including any waiting times.
- **Takt time:** the rate at which a product needs to be created to meet customer needs.
- The cycle and lead time are determined by the process. Takt time is determined by the customer.

- Process
- Cycle times
- Customer need

→

Knowing your process times (cycle, lead, takt)

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- Lead time
- Takt time

1. Ensure process is under control (no large changes)
2. Obtain cycle times for each step, by measurement.
3. Determine times of non-value added activities.
4. Combine value-added times and non-value added times to obtain lead time.
5. Using customer demand, determine the takt time
   - (takt time) = (allowed time) / (number of units)
6. Compare takt time to the cycle times
   - If (takt time) < (all cycle times) then good
   - If (takt time) > (any cycle time) then cannot meet customer rate, need to improve process
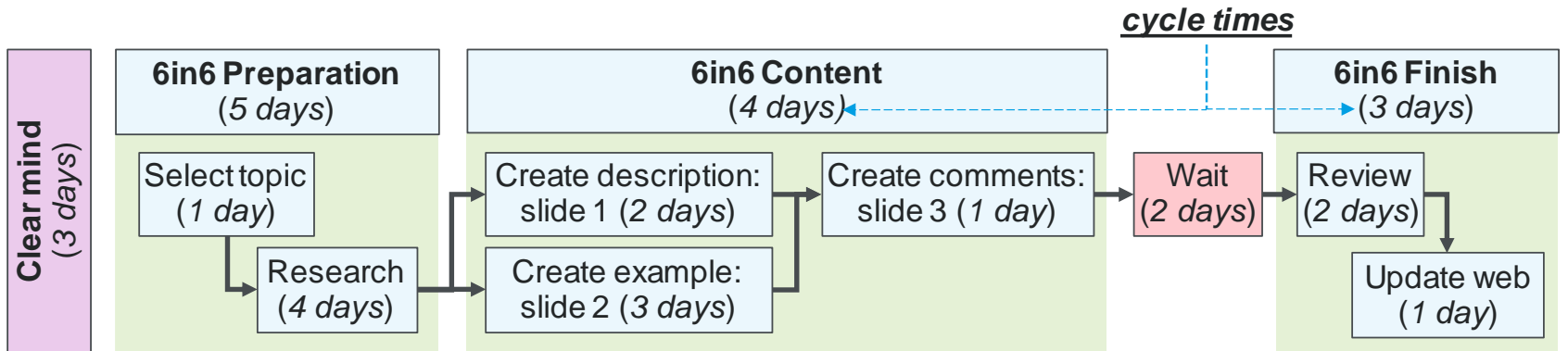

Cumulative Flow Diagram

quantity
- Orders
- To do
- In progress
- Completed

backlog
WIP
cycle time
lead time
date

Times – Example – Creating 6in6 presentations

PROCESS BASED VALUES (cycle times and lead time)
- Creating a 6in6 presentation has three value stream steps: Preparation, Content, Finish.
- Each step and each sub-step have cycle times.
- For the process below, the cycles times are listed in each box.
- The calculated **lead time** is **(17 days)/unit.**

cycle times

| **Clear mind** (*3 days*) | **6in6 Preparation** (*5 days*) | | **6in6 Content** (*4 days*) | | | | **6in6 Finish** (*3 days*) |

- Select topic (*1 day*)
- Research (*4 days*)
- Create description: slide 1 (*2 days*)
- Create example: slide 2 (*3 days*)
- Create comments: slide 3 (*1 day*)
- Wait (*2 days*)
- Review (*2 days*)
- Update web (*1 day*)

Creating a 6in6 presentation: *lead time = 3 + 5 + 4 + 2 + 3 = 17 days per unit*

CUSTOMER BASED VALUE (takt time)
- Suppose a customer requests 26 new 6in6 presentations per year.
- The work year has 260 days = (52 weeks) * (5 work days per week)
- The **takt time** is:

    (takt time) = (1 year)/(26 units) = (260 days)/(26 units) = **(10 days)/unit**
- Since **(each cycle time) < (takt time)**, the process achieves the customer output rate.

Times – Notes

Slide 1

1. A machine's cycle time can be determined by dividing the time needed to produce a set of units by the number of units produced. For example, a machine producing 12 units in an hour has a cycle time of 5 minutes per unit.
2. In German, TAKT stands for *Takzeit*, which means the rhythm of music.
3. Takt time assumes a constant customer demand rate; if it fluctuates then the takt time needs to be adjusted.
4. Takt Time is a key lean manufacturing metric since it drives the entire production process.
5. A *Cumulative Flow Diagram* (CFD) is commonly used to assess times.
   A. The horizontal axis has the time, the vertical axis has the number of units.
   B. The CFD shows the cycle time, arrival rate, throughput rate, and WIP (work in process).
6. *Workload Balancing* is needed when some cycle time exceeds the takt time. This can be done in many ways; see the 6in6 presentation on Theory of Constraints..

Slide 2

1. The longest single activity in the process shown is 4 days. Hence, in principle, a new 6in6 presentation could be completed every 4 days.

Recommended web sites for more information
- https://business.adobe.com/blog/basics/cumulative-flow
- https://www.simplilearn.com/time-confusion-cycle-time-takt-time-lead-time-part-1-article