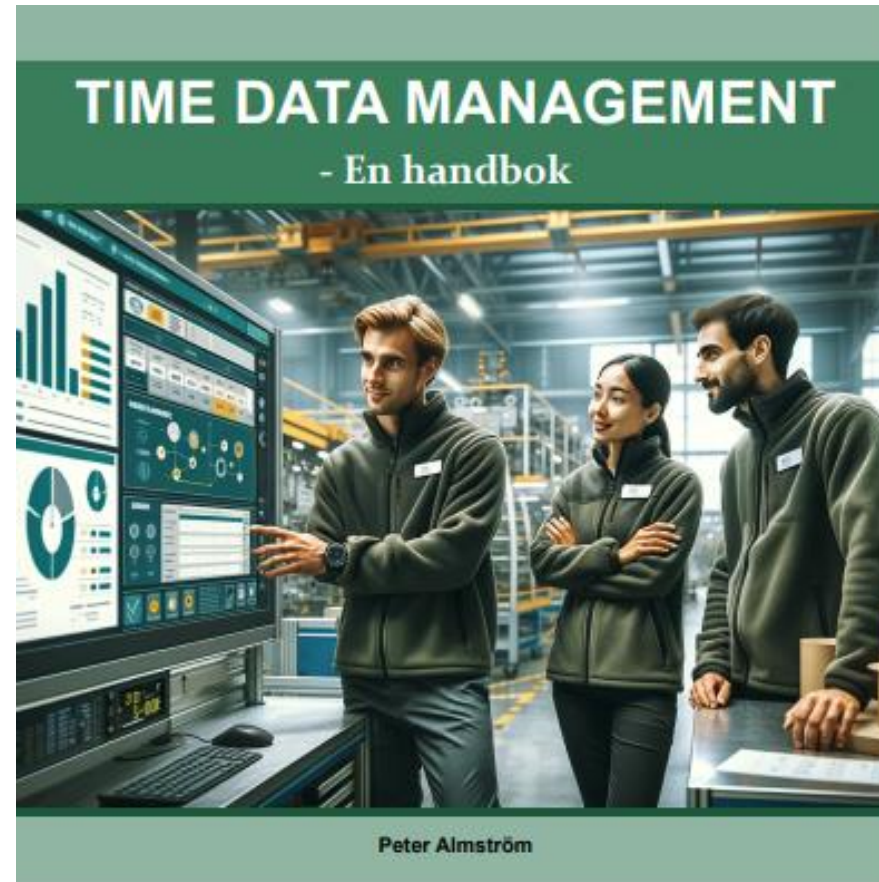


A V I X

TIMEBLY

- Chalmers, KTH, HiS, RISE, FCC
- BAE Systems, Saab Dynamics, Scania, Swegon, Strömsholmen, Solme
- Goal: Effective TDM



TIMEBLY - Time Data Management Automation for Manual Assembly
A research project funded by Sweden's Innovation Agency - Vinnova



TIME DATA MANGEMENT

Time is set the right way

Time is used the right way

Time is updated the right way

- Plan production
- Enable simulation and optimization
- Increase productivity
- Fair workload
- Right price
- Right investment
- Continuous improvement



DEFINITION OF TIME

- Cycle times, setup times, lead times, throughput times, allowance time, FTT, MTBF...
- Value adding time, Non value adding time
- Planned time, Actual time
- Different times to calculate different KPI:s (OEE)



Conclusion

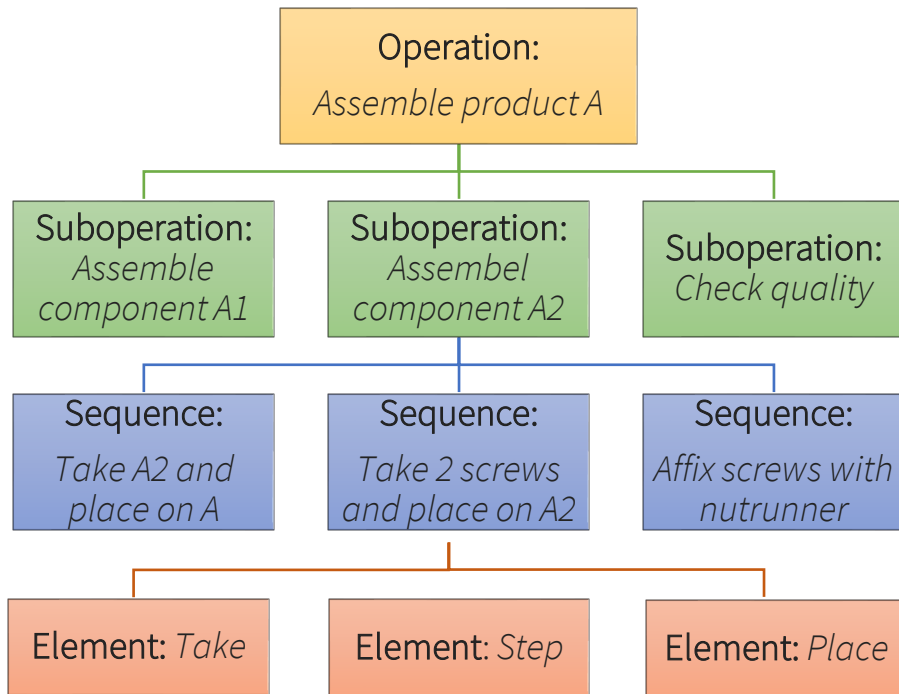
Companies needs to define at least 50 different times

Name	Unit	Definition
Cycle time	Seconds	Time from the start of assembly of one product to the start of assembly for the next product.
Re-setting time	Minutes	Time from the last component in batch N to the start of the first component in batch N+1.



DEFINITION OF ACTIVITIES

Activity hierarchy

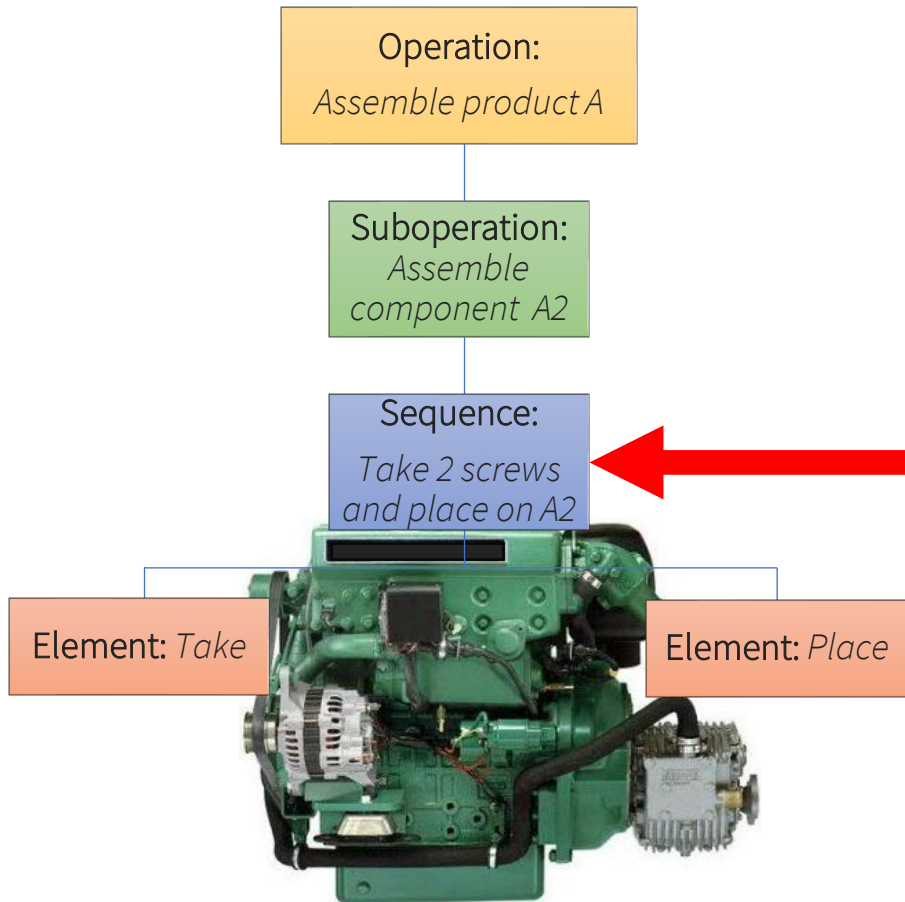


4 criteria an operation step should fulfill

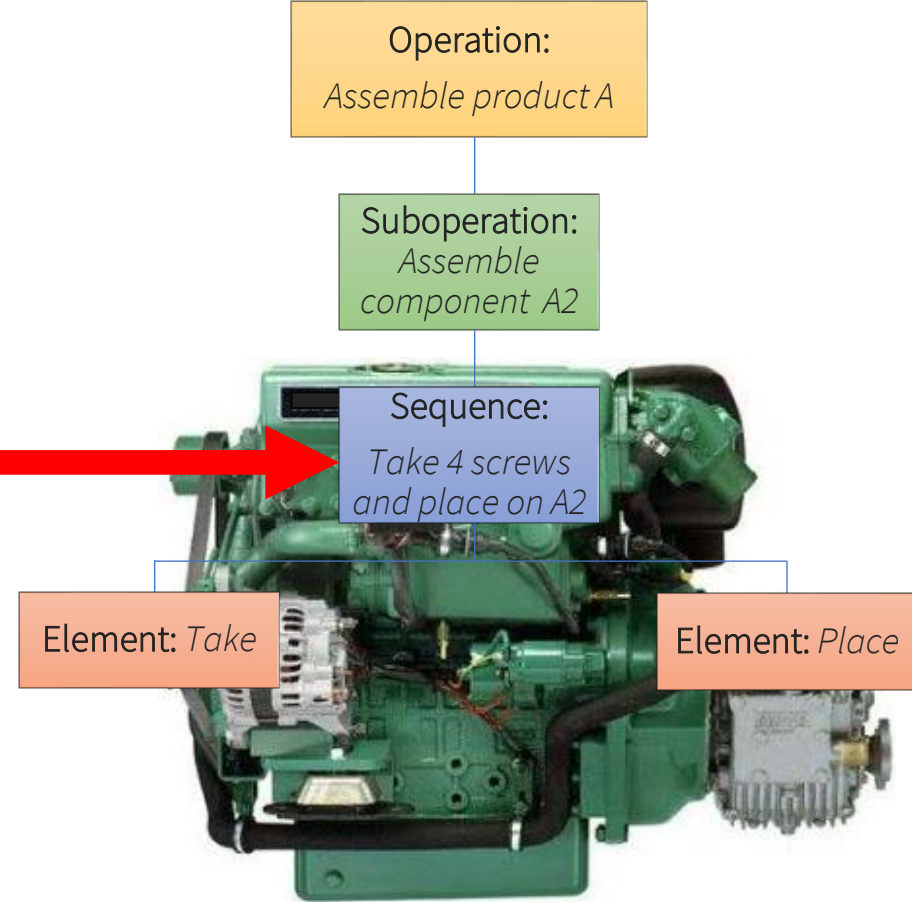
1. Universally usable, by generalizing names
2. Repeatable, can be multiplied
3. Combinable, boundaries between operation steps.
4. Descriptive, can be used in a work instruction

GENERALIZE

Specific Operation Step (SOS)

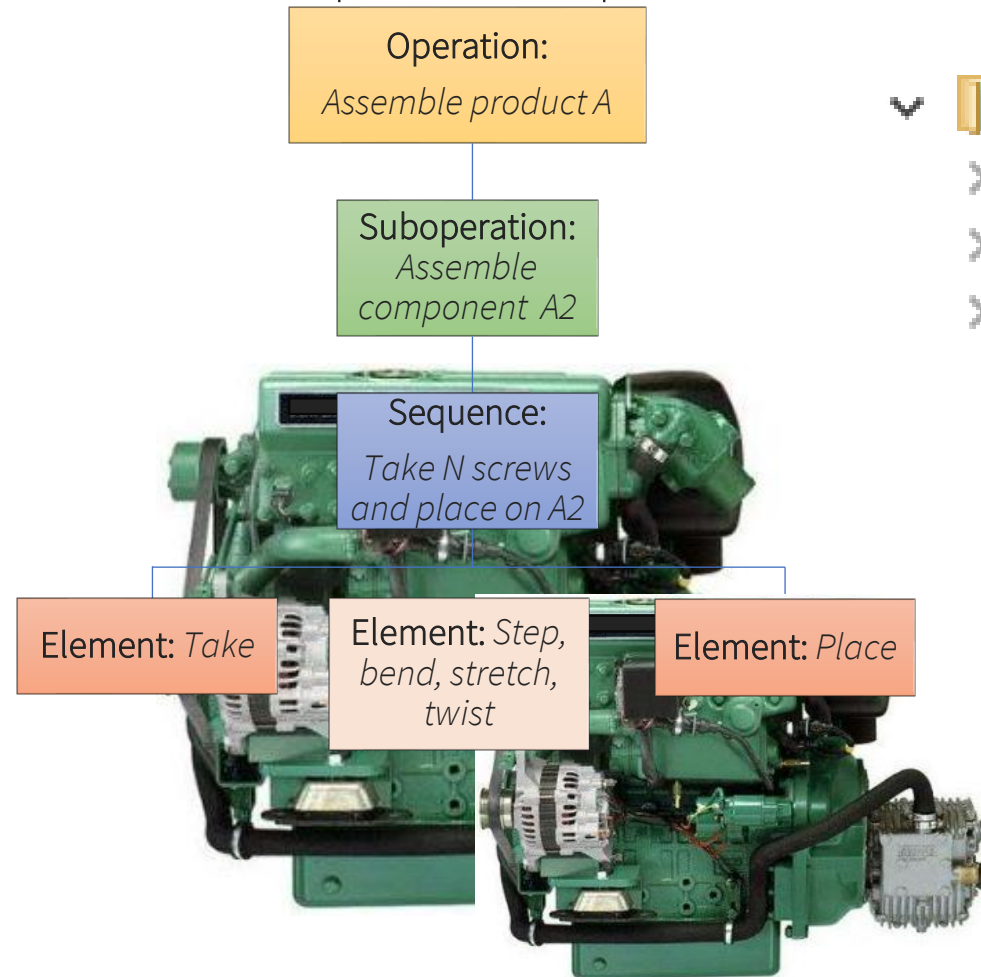


Specific Operation Step (SOS)



GENERALIZE

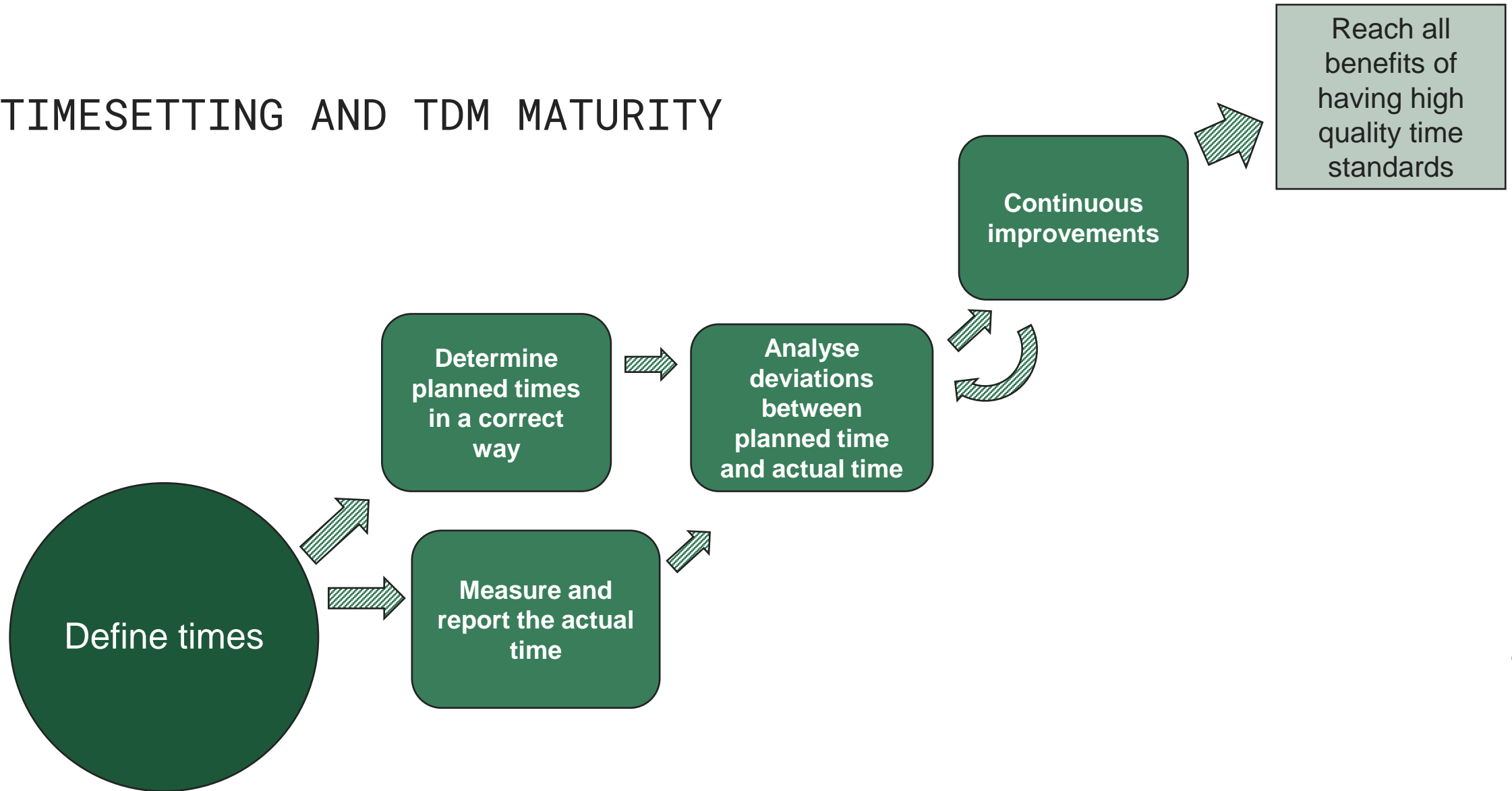
General Operation Step (GOS)



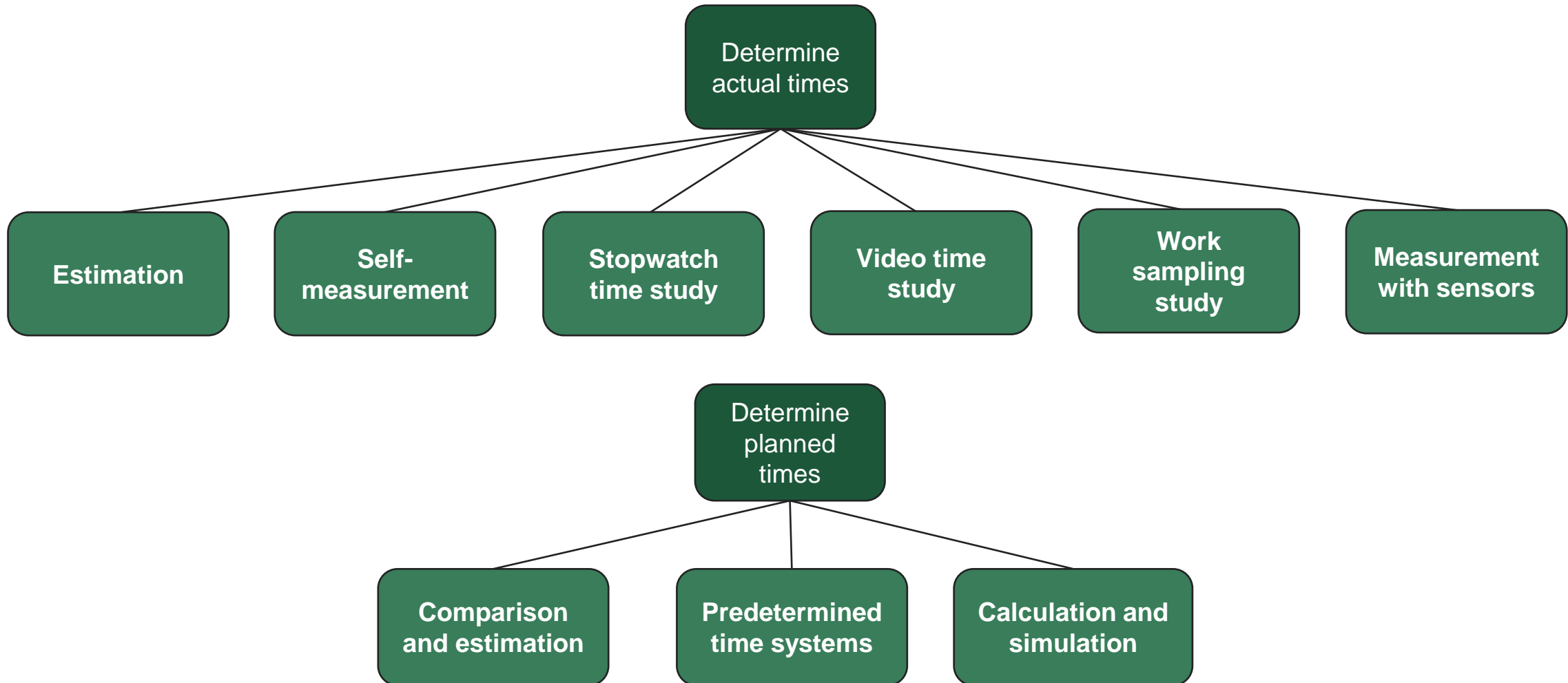
- ▼ **General Operation Step (GOS)**
 - > [FO] Frequency Operations
 - > [GO] General Operations
 - > [PO] Product Operations
 - [LO] Layout dependent Operations



TIMESETTING AND TDM MATURITY



THE MOST COMMON TIMESETTING METHODS



INTRODUCE TIME BLOCKS

- Time block is a combination of element or operation steps (from the GOS)
- Any timesetting method can be used
- Effective at companies that has high number of variations.
- Trade off between accuracy and cost. Purpose decide.
- Simplifies the analysis

Purpose	Recommended precision $\pm\%$
Find improvement potential	8
Determine salary	1
Plan production (Scheduling, loading, sequencing)	5
Balance a line	4
Optimize production plan (optimization algorithm)	3
Calculate cost in early phases	12
Calculate cost for make-or-buy decisions	9
Calculate offer to customer	7
Make investment calculation	10



TIME BLOCK USING VARIABLES

- **Efficient:** 75% time saved when setting time at Volvo cars
- **Correct:** 97% of the SAM time
- **Simple:** Descriptive time blocks. User only added variable value.

General operation step (GOS) database

Operation step definition	Time equation	Constants	Constant time	Variables
Assemble first screw	$T=A$	A=Time for first screw	135 TMU	
Assemble subsequent screw	$T=(N-1)*B$	B=Time per screw	55 TMU	N=Number of screws
Return tool	$T=C$	C=Return time	40 TMU	



Parametric time block (PTB)

Assemble screw M8-M16

Assemble first screw

Assemble subsequent screw

Return tool

Time equation
 $T=A+(N-1)*B+C$



Time block interface

Assemble N screw M8-M16

Enter no. of screws:

Total time: 450 TMU (16,2 s)



DESIGN PROCEDURES FOR TIME BLOCKS

1. Define **names** for components, tools, machines, and locations.
2. Determine **syntax** for expressing operation steps.
3. Start by **formulating** a number of SOS.
4. Find **common movements** and formulate GOS accordingly.
5. Use the **four criteria** to delimit GOS.
6. Determine how large GOS can be depending on **precision requirements**.
7. Aim to have **as few** SOS left as possible.
8. Define a **time equation** with constants and variables for each operation step.
9. Use **appropriate method** to determine time for GOS and SOS.



ONE EXAMPLE FROM THE TIMEBLY PROJECT...

- Created time blocks at Strömsholmen.
- Used spreadsheet to formulate the operation step structure. There after documented in AVIX.

Use of timeblocks at Strömsholmen AB

Layout independent GOS to form a time block

Steps are added in the method

Metodresultat | Relationer | Noteringar | Processer | Problemlösning | Metodträd | Artiklar | Verktyg

- Anteckna
- Avsluta
- Blåsa
- Dosera
- Fylla
- Hjälpa
- Hämta
- Klippa
- Lämna
- Montera
- Mäta
- Paketera
- Plocka
- Registrera
- Skriva ut
- Ställa
- Stämpla
 - Stämpla information på rör
 - Stämpla information på rör mha lasermaskin
 - Stämpla information på rör mha nålpräglingsmaskin
 - Stämpla information på rör mha rullstämplingsmaskin
 - [x] -
 - [x] Tag rör från pallvagn mha fingrar
 - [x] Placera rör i rullstämplingsmaskin mha fingrar
 - [x] Justera position på rör mha fingrar
 - [x] Genomför cykel i rullstämplingsmaskin mha knappar
 - [x] Plocka rör från rullstämplingsmaskin mha fingrar
 - Tvätta

SAB

- Tool&Die
 - Hantering av MO
 - Hantering av material
 - Yttre resurser
 - Standard X - Med gasfyllning
 - Station 1
 - Montör 1
 - Anteckna anställningsnummer/serienummer/charge på MO
 - Stämpla information på rör mha rullstämplingsmaskin
 -
 - Tag rör från pallvagn mha fingrar
 -
 - Placera rör i rullstämplingsmaskin mha fingrar
 - Justera position på rör mha fingrar
 - Genomför cykel i rullstämplingsmaskin mha knappar
 - Plocka rör från rullstämplingsmaskin mha fingrar
 - Station 2
 - Station 3
 - Standard X - Utan fyllning
 - Standard TU - Med fyllning
 - Standard TU - Utan fyllning

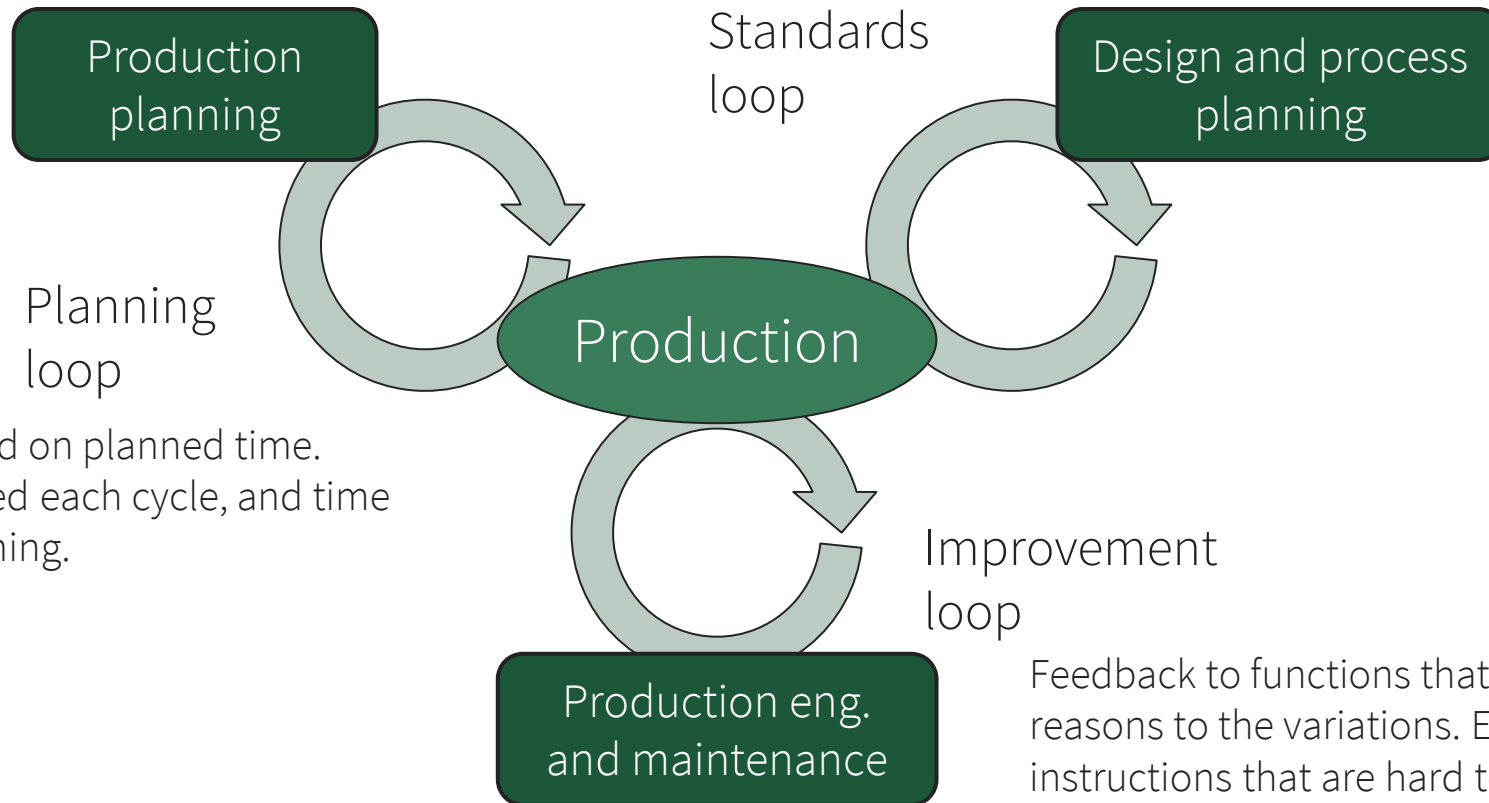
USE TIME BLOCK TO ESTIMATE COST AND PLANNING

- **Product design** – Evaluate/challenge design concept, from a manufacturing perspective.
- **Product preparation** – Make/Buy
- **Production preparation** – Future scenarios, simulation at early phases. Challenge the "Master process".
- **Production planning** – Decide production plan, schedule, order sequencing
- **Finance** – Create accurate offer.



ADMINISTRATE THE TDM

Planned times developed by preparation feedback from assembly is deviation comes from deviations in method, or if the design allows time deviations.



Production plans based on planned time. Accurate time measured each cycle, and time data feedback to planning.

Improvement loop

Feedback to functions that can improve the reasons to the variations. E.g. unclear work instructions that are hard to follow.



Download

Time Data Management
– a handbook



Ladda ner

Time Data Management
– en handbok



THANK YOU!

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