MTM Base

Guideline to create an Ethical and Optimized Workplace

MTM Base Work Study

- Observing the worker at work
- Study the way of doing things
- The Systematic analysis and design of work methods and systems
- Critical examination of existing and proposed ways of doing work

1. Select the work to be studied
2. Record all relevant information about that work
3. Examine the recorded work
4. Develope and improve new way of doing things
5. Install the new method as a standard
6. Maintain the new standard

MTM Base Method

Critical Examination of Method

Purpose	What is being done? Why is it being done? What else can be done?
Place	Where is it being done? Why is it being done there? Where should it be done?
Sequence	When is it being done? Why then? When else can it be done? When it should be done?
Person	Who is doing it? Why he/she is doing it? Who else can do it? Who should do it?
Means	How is it being done? Why is it being done that way? How else can it be done?

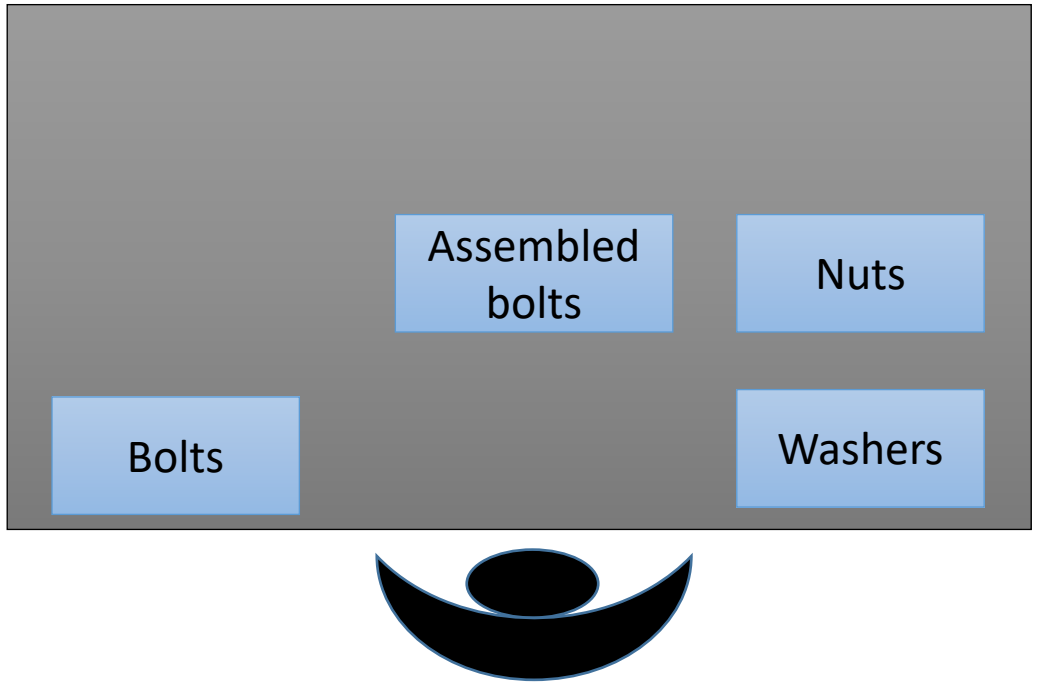
MTM Base Method

Assembling a washer and nut on a bolt

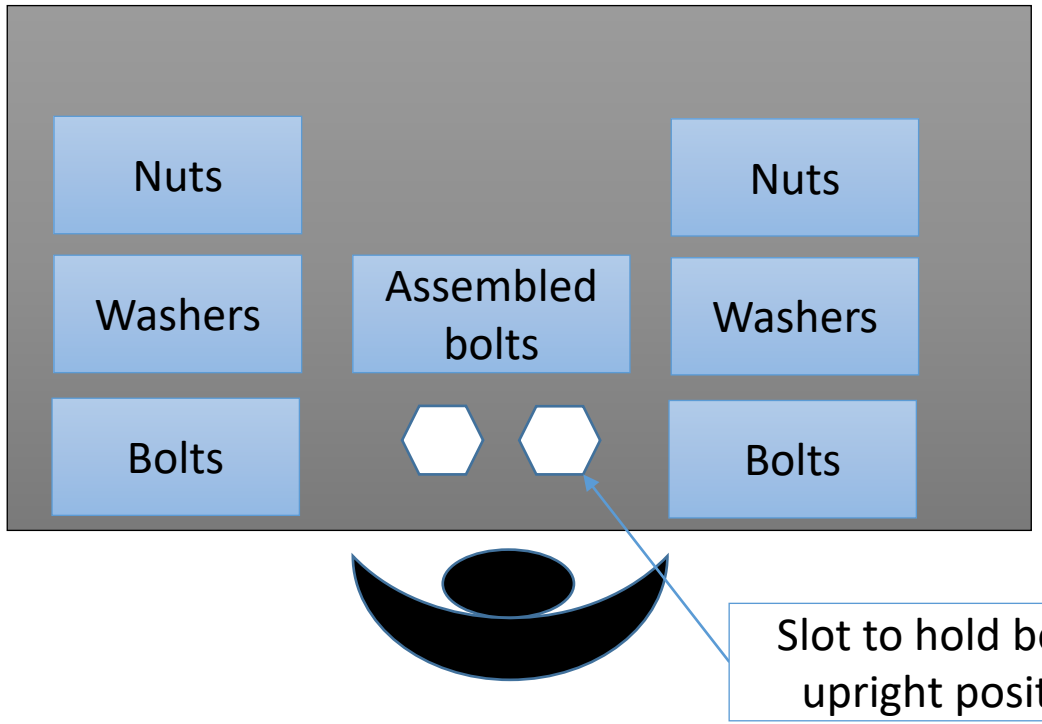
Left Hand	Right hand
To tray of bolts	To washers tray
Pick up one bolt	Pick up one washer
To assembly position	To assembly position
Grip bolt	Drop washer on bolt
	To nuts tray
	Pick up a nut
	To assembly position
	Thread a nut
Drop bolt in assembled bolts tray	

MTM Base Lay-out

Existing workplace



Revised workplace



MTM Base Method

Assembling a washer and nut on a bolt after revised workplace

Left Hand	Right hand
To tray of bolts	To tray of bolts
Pick up one bolt	Pick up one bolt
To slot	To slot
Place bolt in slot	Place bolt in slot
To washer tray	To washer tray
Pick up a washer	Pick up a washer
To assembly position	To assembly position
Drop washer on bolt	Drop washer on bolt
To nuts tray	To nuts tray
Pick up a nut	Pick up a nut
To assembly position	To assembly position
Thread nut on bolt	Thread nut on bolt
Drop bolt in assembled bolts tray	Drop bolt in assembled bolts tray

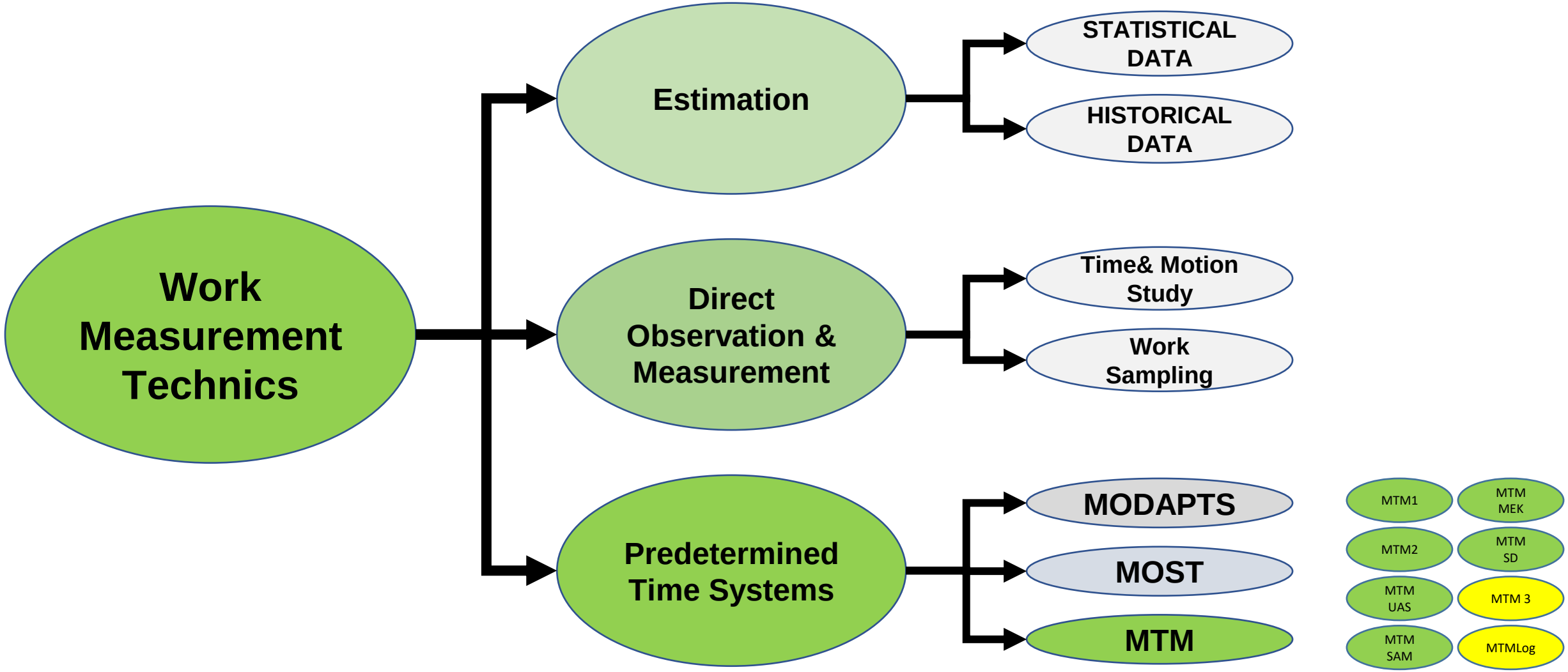
MTM Base Method

Assembling a washer and nut on a bolt after revised workplace Time added

Left Hand	Time	Right hand	Time
To tray of bolts		To tray of bolts	
Pick up one bolt		Pick up one bolt	
To slot		To slot	
Place bolt in slot		Place bolt in slot	
To washer tray		To washer tray	
Pick up a washer		Pick up a washer	
To assembly position		To assembly position	
Drop washer on bolt		Drop washer on bolt	
To nuts tray		To nuts tray	
Pick up a nut		Pick up a nut	
To assembly position		To assembly position	
Thread nut on bolt		Thread nut on bolt	
Drop bolt in assembled bolts tray		Drop bolt in assembled bolts tray	

MTM Base

Work Measurement Technics



MTM-EWD Methodology Platform

STOPWATCH PATH

MODULE 1:

INTRODUCTION TO WORK ANALYSIS

Mandatory: 8 h

MODULE 2:

STOPWATCH CONCEPTS

Mandatory: 16 h

MODULE 3:

PACE RATING & STOPWATCH PRACTICE *(video films)*

Mandatory: 16 h

EWD - DIPLOMA

MTM PATH

Introduction to MTM-EWD

- Introduction to Work Analysis (8 h)
- Ergonomics (2 h)
- MTM-1 (12 h)
- Definition of Indicators: KD, KE, KI, KA (2 h)

Recommended: 24 h
Minimum: 16 h (1)

MTM-1
Mandatory: 80 h

MTM-2
Recommended: 40 h
Minimum: 32 h (1)

MTM-3
Recommended: 40 h
Minimum: 24 h (1)

MTM-UAS
Recommended: 40 h
Minimum: 24 h (1)

SAM
Recommended: 40 h
Minimum: 24 h (1)

LOGISTIC
Recommended: 16 h
Minimum: 12 h (1)

UAS(2)

SAM (2)

STOPWATCH(2)

EWD - DIPLOMA

\+ Practitioner on site (40 h) =

EWD - CERTIFICATE

OTHERS

- **Static Line Balancing** 2 days
- **Dynamic Line Balancing** 2 days
- **MTM-SOD On-site** 2 days
- **MTM Sewing** 3 days
- **ERGO-ILO** 2 days
- **ERGO-OCRA** 2 days
- **ERGO-EAWS** 5 days
- **ERGO-SAM** 1 days

(1) *Exception: Assistants from same Company and level with ME background and small groups (max. 8)*
(2) *UAS, SAM or Stopwatch previous knowledge*

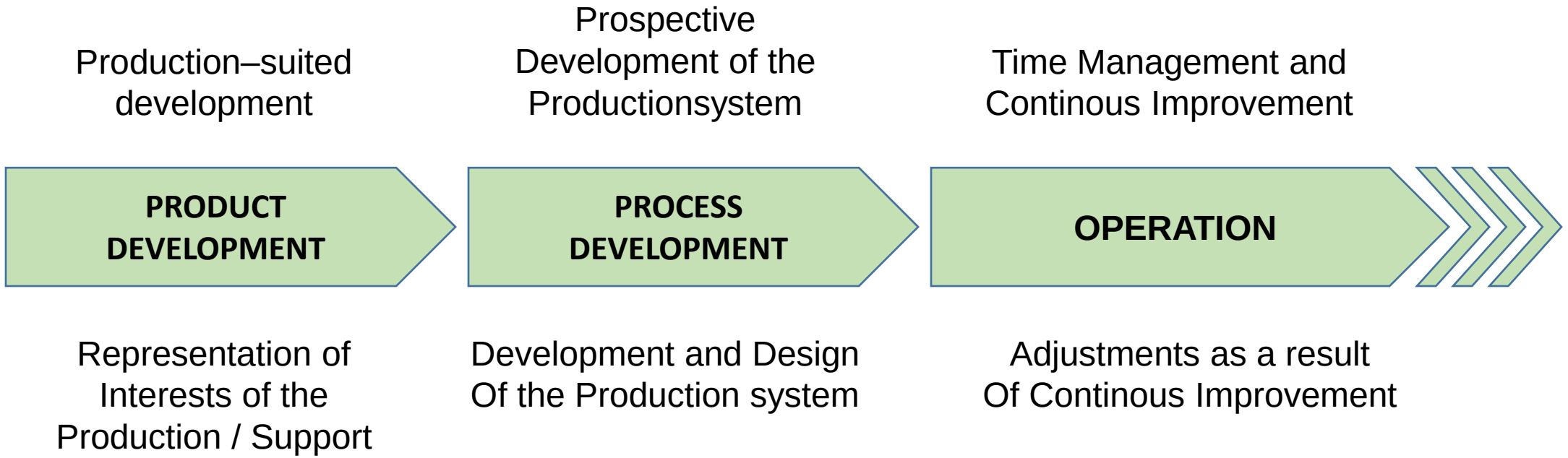
MTM Base

Basic Movements in MTM:

- Reach
- Grasp
- Move
- Position
- Release

MTM Base

User (IE) of MTM (PTS)



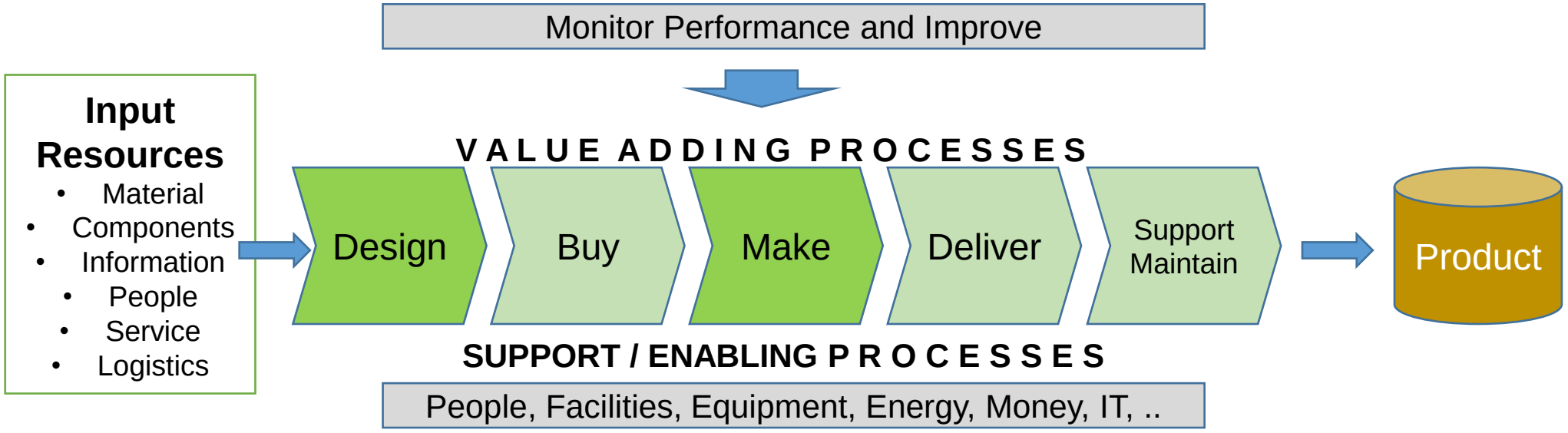
Tasks of a Process Planner

MTM Base

Plan Level 1: Strategic

Plan Level 2: Tactical

Plan Level 3: Operational



MTM Base – Need training

Knowledge

Understanding

Theory

- Theoretical input of MTM
- Understanding the use of Methodology

Application

Analysis

Synthesis

Practice

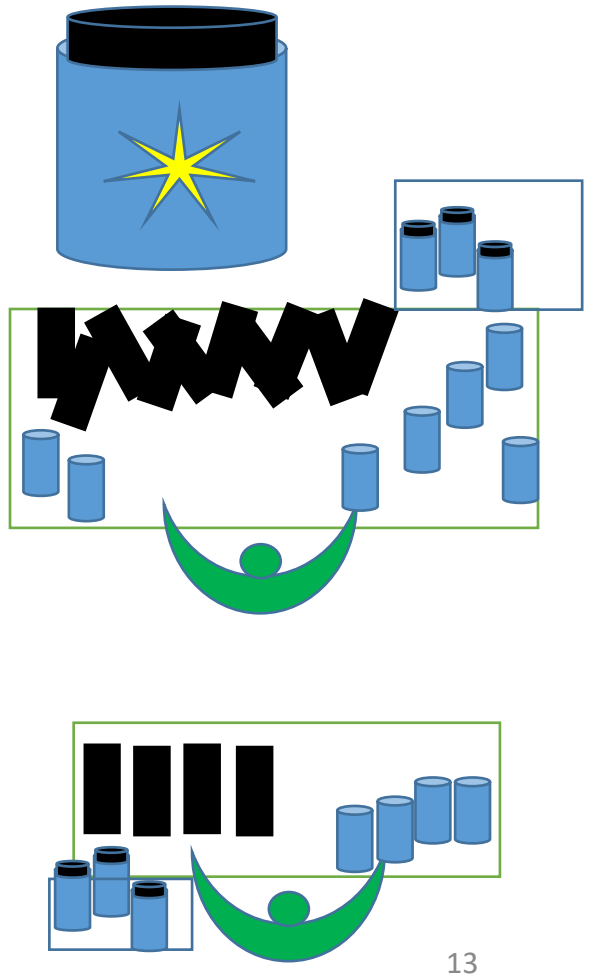
- Use of MTM for optimisation of current workplace including the corresponding tools (analysis sheet, checklists,..)
- Systematic optimization of the workplace

Evaluation

Reflection

- Presentation of each optimization
- Critical reflection of own optimization in comparision to the other solutions

Considered PRODUCT

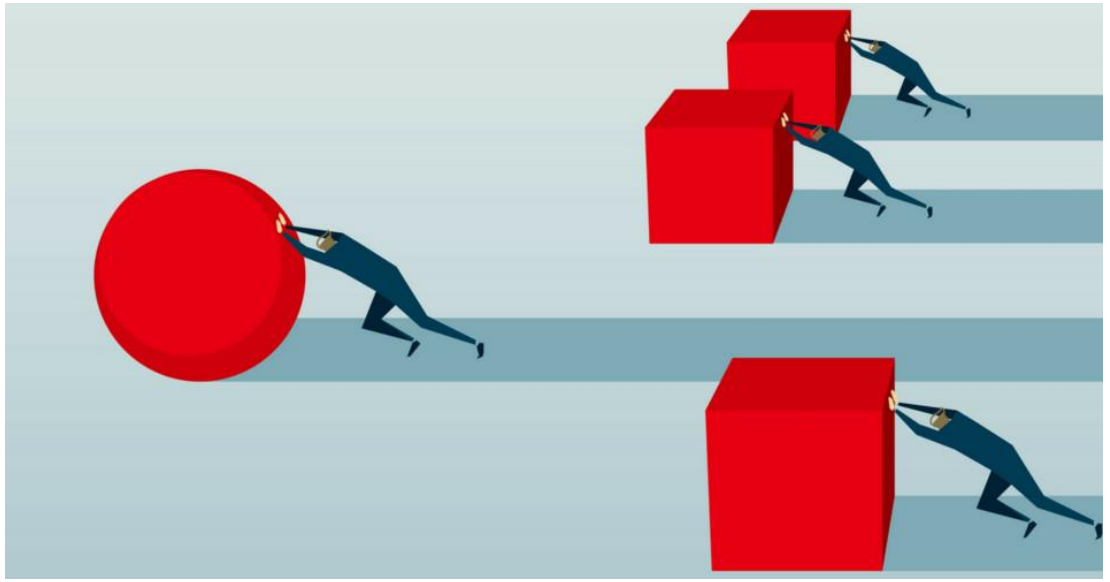


MTM-EWD

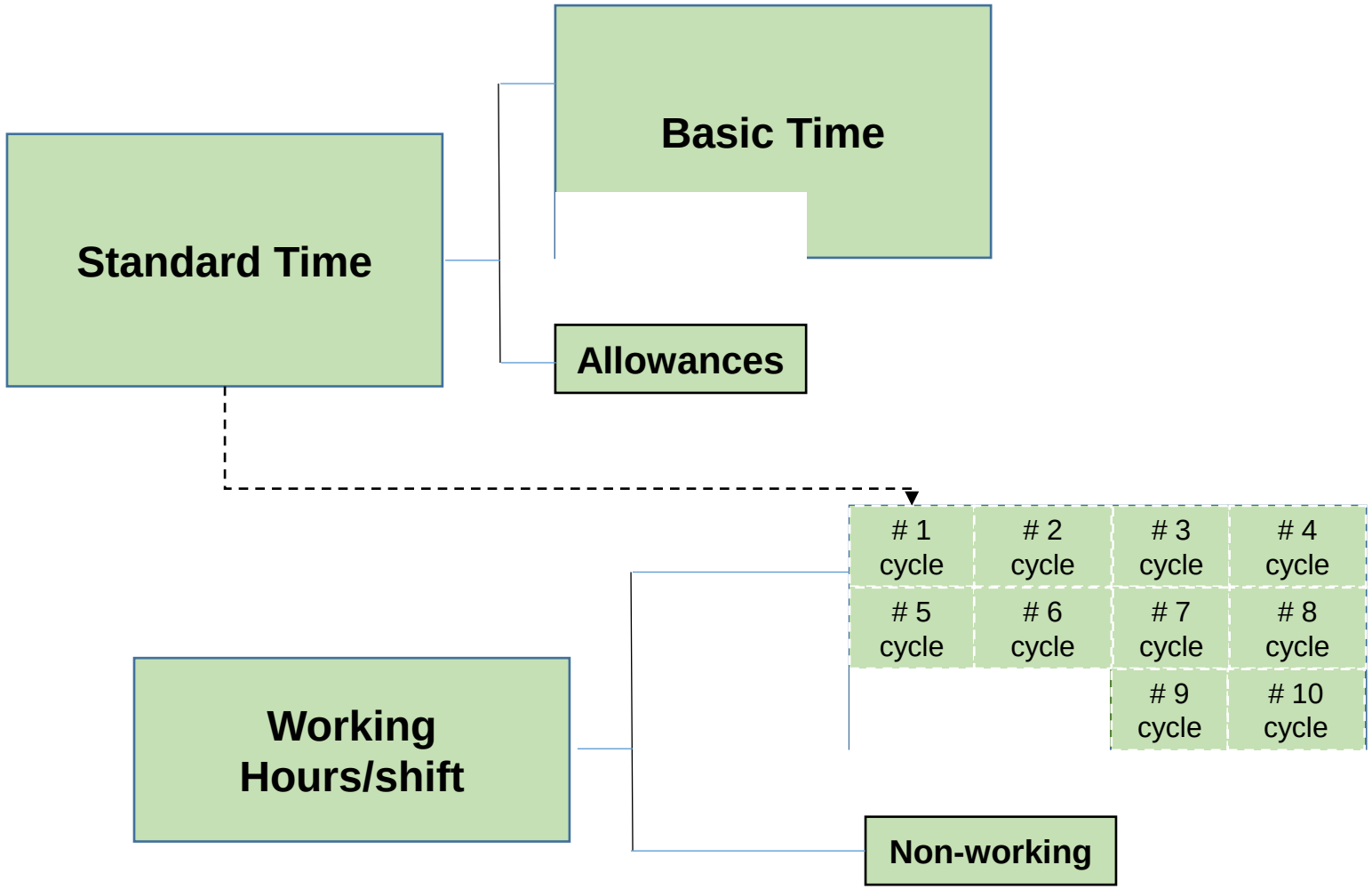
As the result the MTM-EWD can be summarize with:

- **Ethical Productivity:**
  by choosing the right methods first

- **Work smarter not harder**
  By optimizing physiological resources



MTM Base


Standard Time
Basic Time
Allowances
1 cycle
2 cycle
3 cycle
4 cycle
5 cycle
6 cycle
7 cycle
8 cycle
9 cycle
10 cycle
Working Hours/shift
Non-working

MTM Base

Contingency Allowances ILO recommendation

I.L.O. Recommendation of Relaxation Allowances as the percent of Basic Time

	% Added MTM Study
1. CONSTANT ALLOWANCES	
Personal Needs	**5**
Basic Fatigue	4
Total	**9**
2. VARIABLE ADDITIONS TO BASIC FATIGUE ALLOWANCE:	
i) Standing	2
ii) Abnormal position only slightly awakward	0
iii) Awkward	2
iv) Very awakward (lying, stretching up)	7
3. Weightlifting or application of weight lifted in kg	
2,5	0
5	1
10	3
12,5	4
15	6
20	10
4. Light Conditions	
Slightly below recommended value	0
Well below	2
Inadequate	5

	% Added MTM Study
5. Air Conditions (all around) well	0
Badly ventilated but no toxic fumes or gases	5
Work close to furnaces severe, heat, etc	5-15
6. Visual stresses Fairly fine work	0
Fine work	2
Very fine or very exacting work	5
7. Aural Stresses Continous	0
Intermittend, loud intermittend, very loud	2
High pitched loud	5
8. Mental stresses, Fairly complex process	1
Complex or wide span of attention	4
Very complex and complicated	8
9. Monotony (mental) low	0
Medium	1
High	4
10. Monotony (physical) Rather tedious	0
Tedious	2
Very tedious	5

MTM Base

Contingency Allowances ILO recommendation

I.L.O. Recommendation of Relaxation Allowances as the percent of Basic Time

Allowances are actually a compensation of bad work design.

When a workplace is planned and created by minimizing all aspects from following point of view:

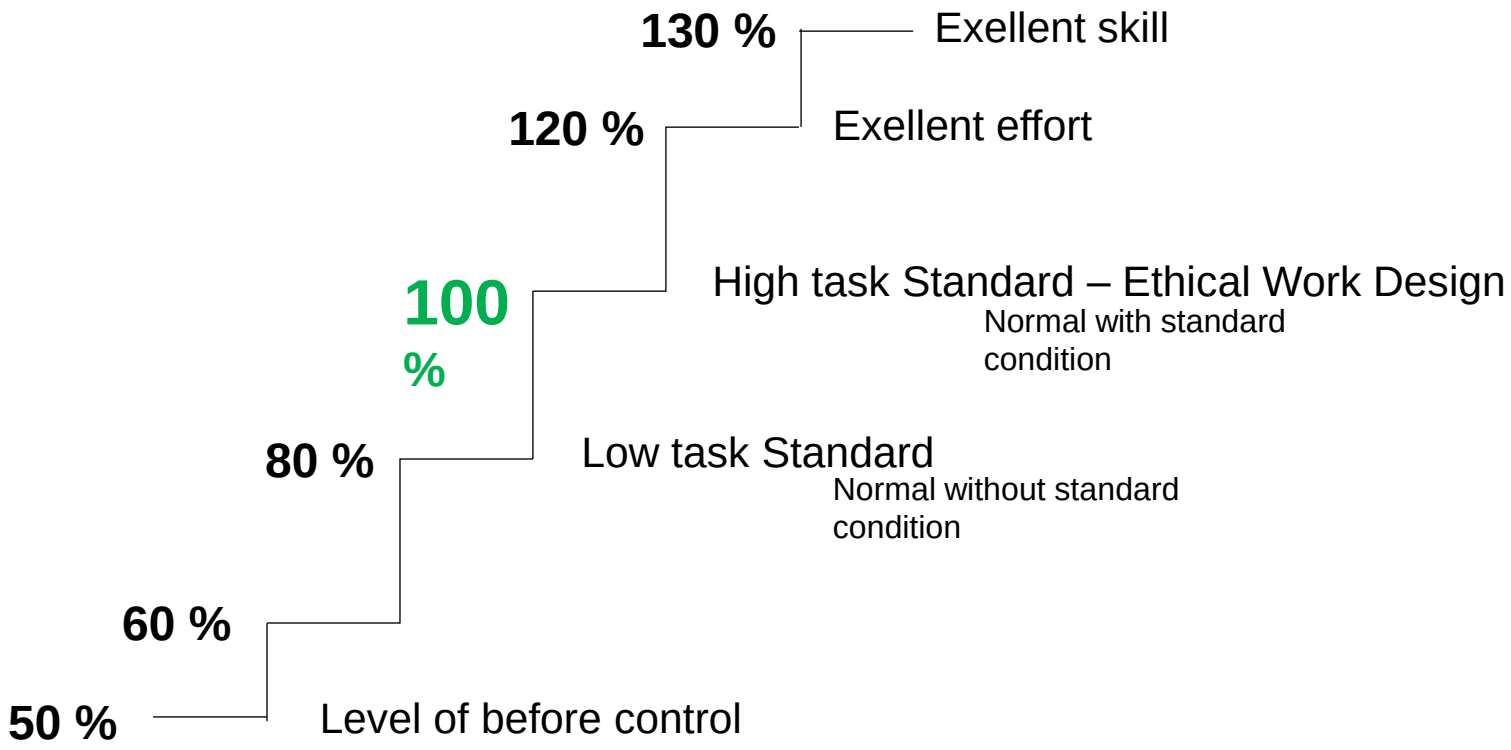
Body postures, Weight lifting, Lighting, Air conditions, Stress factors and Monotony,

The Allowances must be near zero!

Allowances must also take account the working organisation, e.g. If there is a Teamwork with Teamleader or Stand in people it also reduce % of allowances.

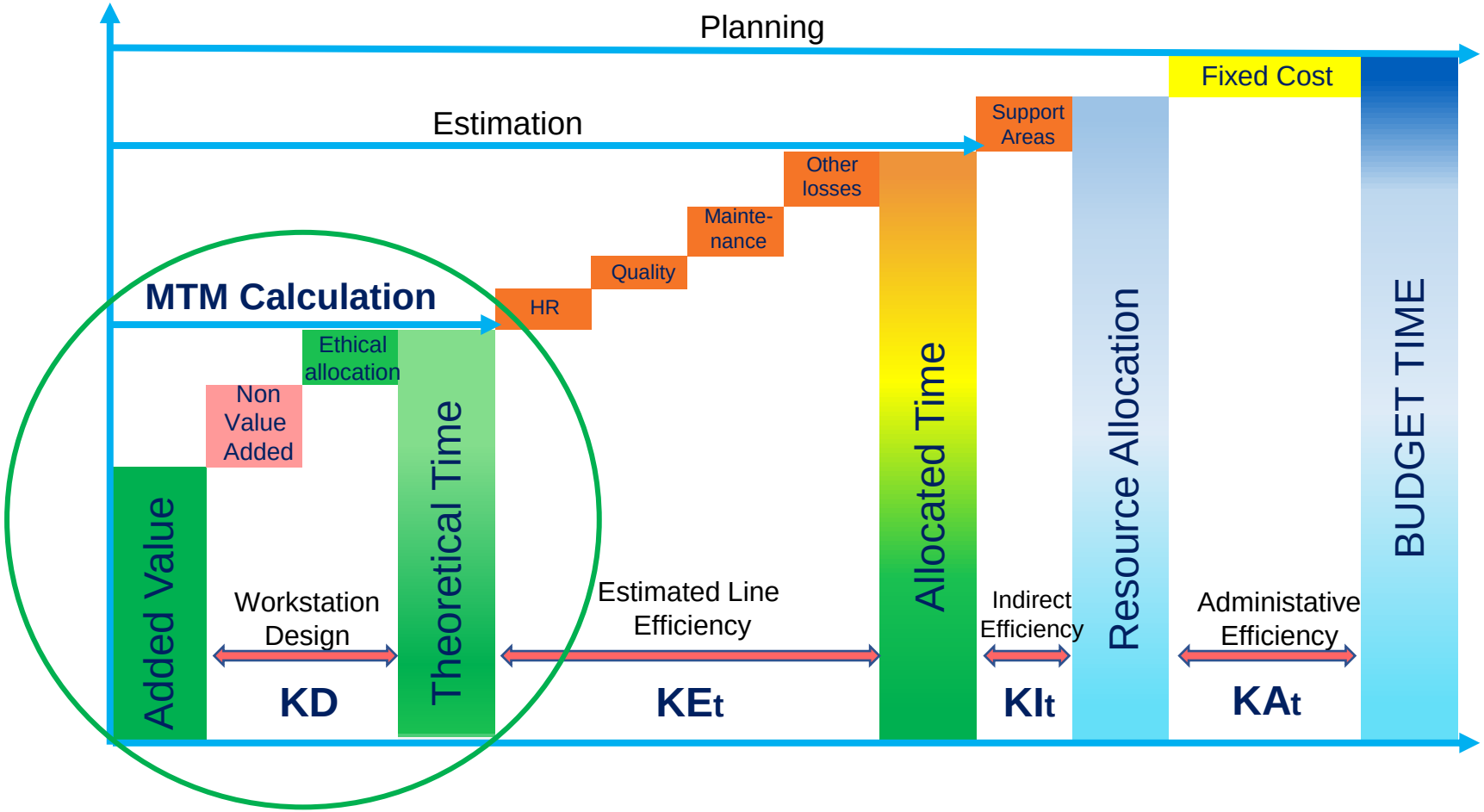
MTM Base

Pace Rating



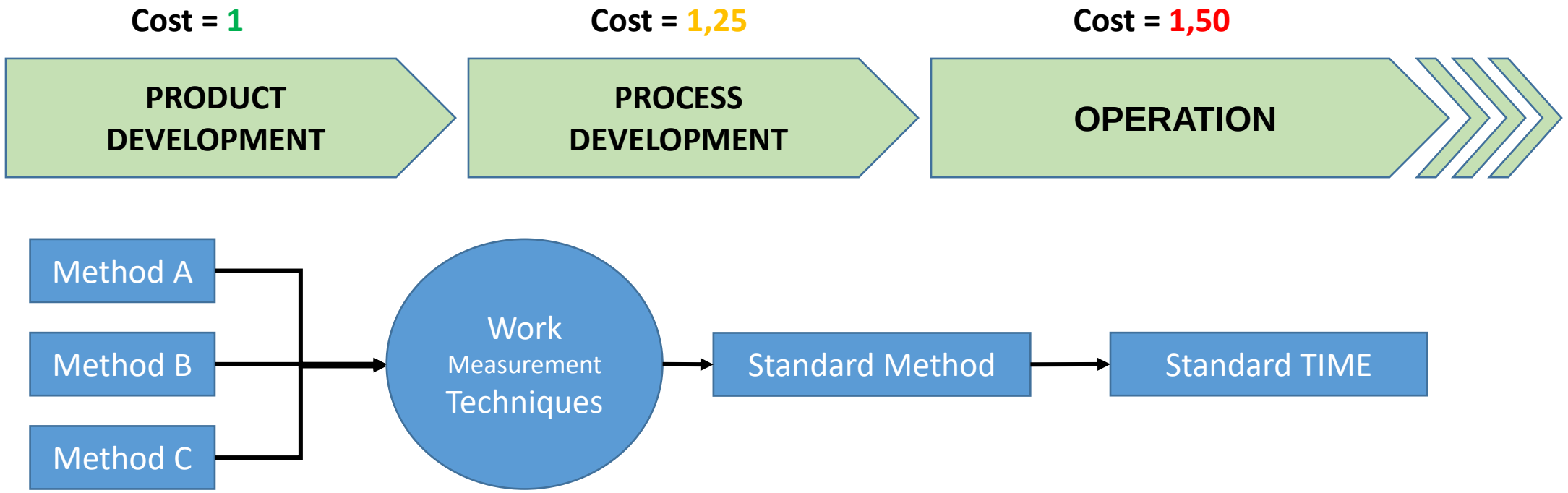
MTM-EWD Time definitions

The following Graph represent the MTM Philosophy in planning phase



MTM Base

To avoid huge costs in PRODUCT CREATION it is important to make Method- and Time Analysis early.



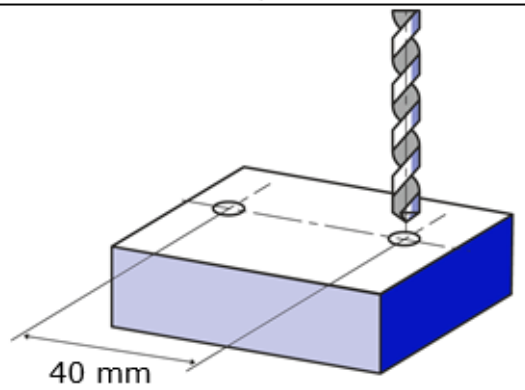
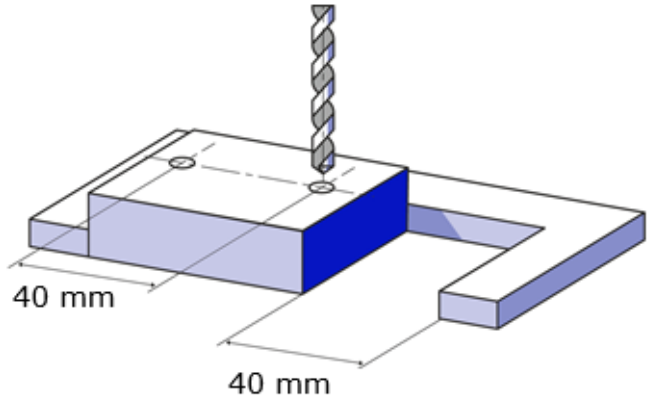
MTM Base Production Cost

Example – Always sum of time and cost

Total Basic Time for One Unit	=	**3.435 minutes**
Allowances 25 %	=	3.435*1.25 = **4.30 minutes**
Wage of worker per minute	=	0.167 Money
Overhead per minute	=	0.334 Money
Total cost per minute	=	0.50 Money
Cost of Labur and Overhead per unit	=	2.15 (4.30*0.50) Money
Cost of material	=	2.00 Money
Total cost per unit	**=**	**4.15 Money**

MTM Base

Method improvement

Bore two holes Ø 12 mm, 40 mm apart in a piece			Using a stop eliminates Position		
					
TMU	Code	Description	TMU	Code	Description
9.8	**M14C**	to 1st hole	7.7	**M14A**	to stop on left edge
16.2	**P2SE**		2.0	**M2A**	at back stop
	.			.	
	.			.	
	.			.	
4.5	**M4C**	to 2nd hole		.	
16.2	**P2SE**		3.1	**M4A**	to stop on right edge
46.7			12.8		

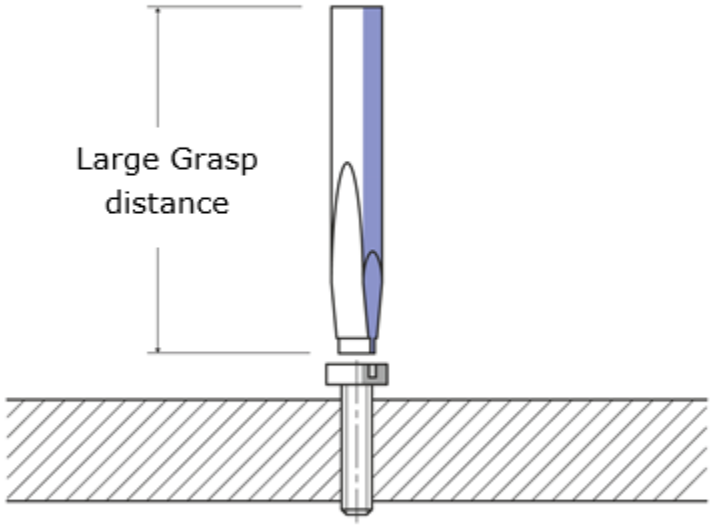
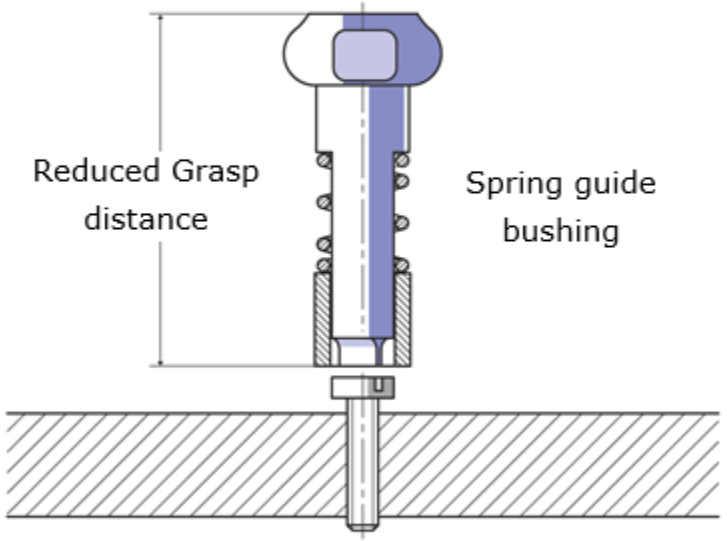
Each TMU is worth
0,0005 €

Savings
0,017 € / part

MTM Base

Method improvement

Through tool or part design, the additional time requirements of 5.6 TMU, with which Difficult Handling is allowed, can often be saved.

Place a flat-head screwdriver at cap screw			Reduce the grasp distance, add a spring guide bushing		
					
TMU	Code	Description	TMU	Code	Description
25.3	**P2SSD**		5.6	**P1SE**	
25.3			5.6		

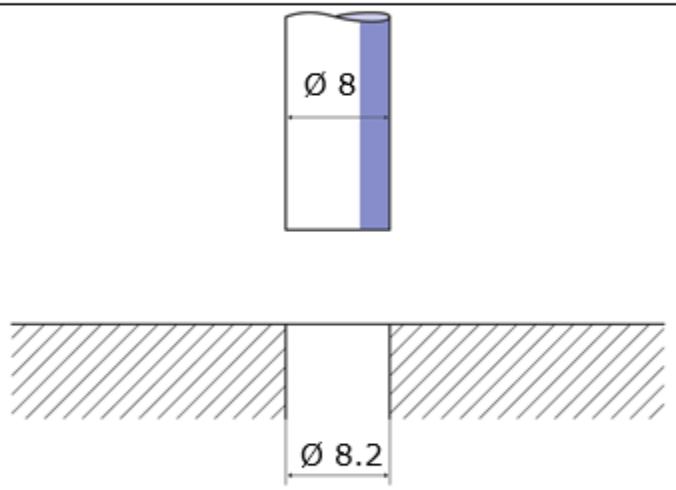
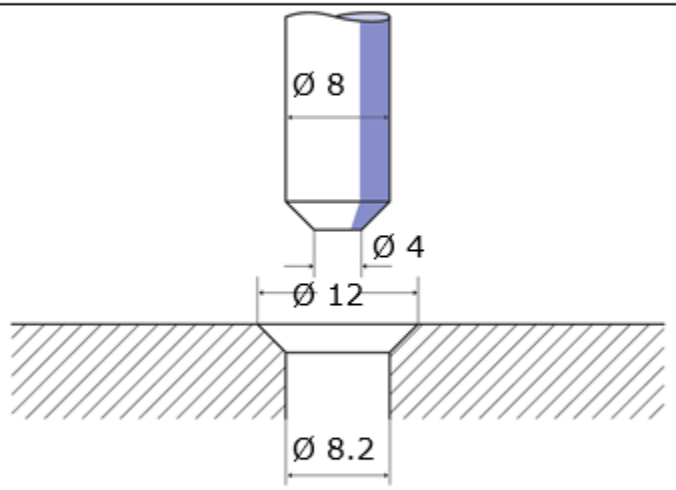
Each TMU is worth 0,0005 €

Savings 0,01 € / part

MTM Base

Method improvement

Total Clearance can often be increased at the point of first position contact by adding chamfers.

Without chamfers (delay at position point)	With chamfers
	

TMU	Code	Description	TMU	Code	Description
16.2	**P2SE**		5.6	**P1SE**	

Each TMU is worth
0,0005 €

Savings
0,005 € / part

MTM Base

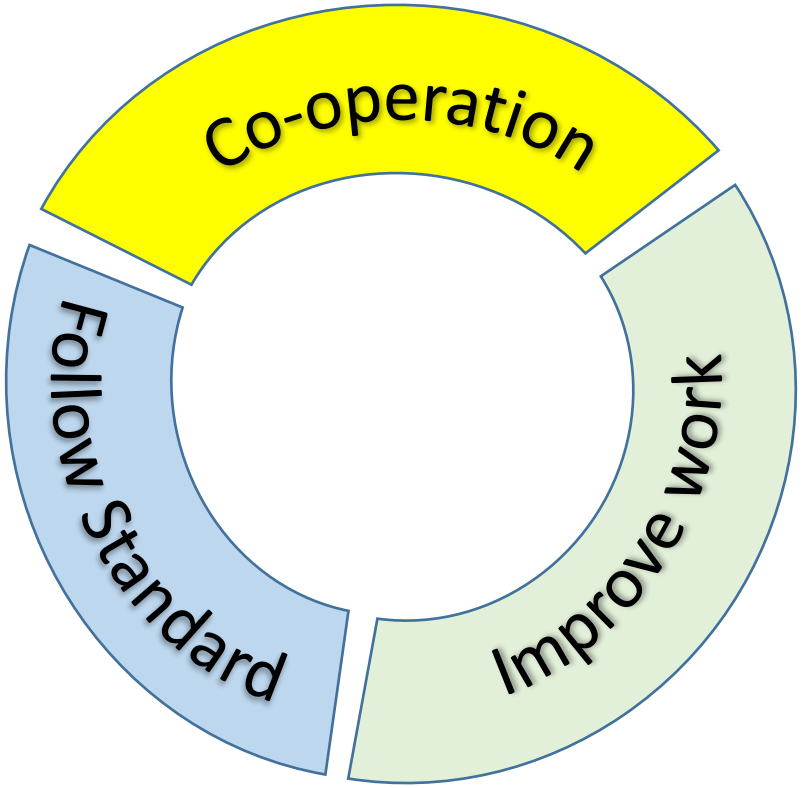
Logistical

- Storage, warehousing and materials handling.
- Packaging and unitisation.
- Inventory.
- Transport.
- Information and control.

MTM Base

Execute the work & Improve the work

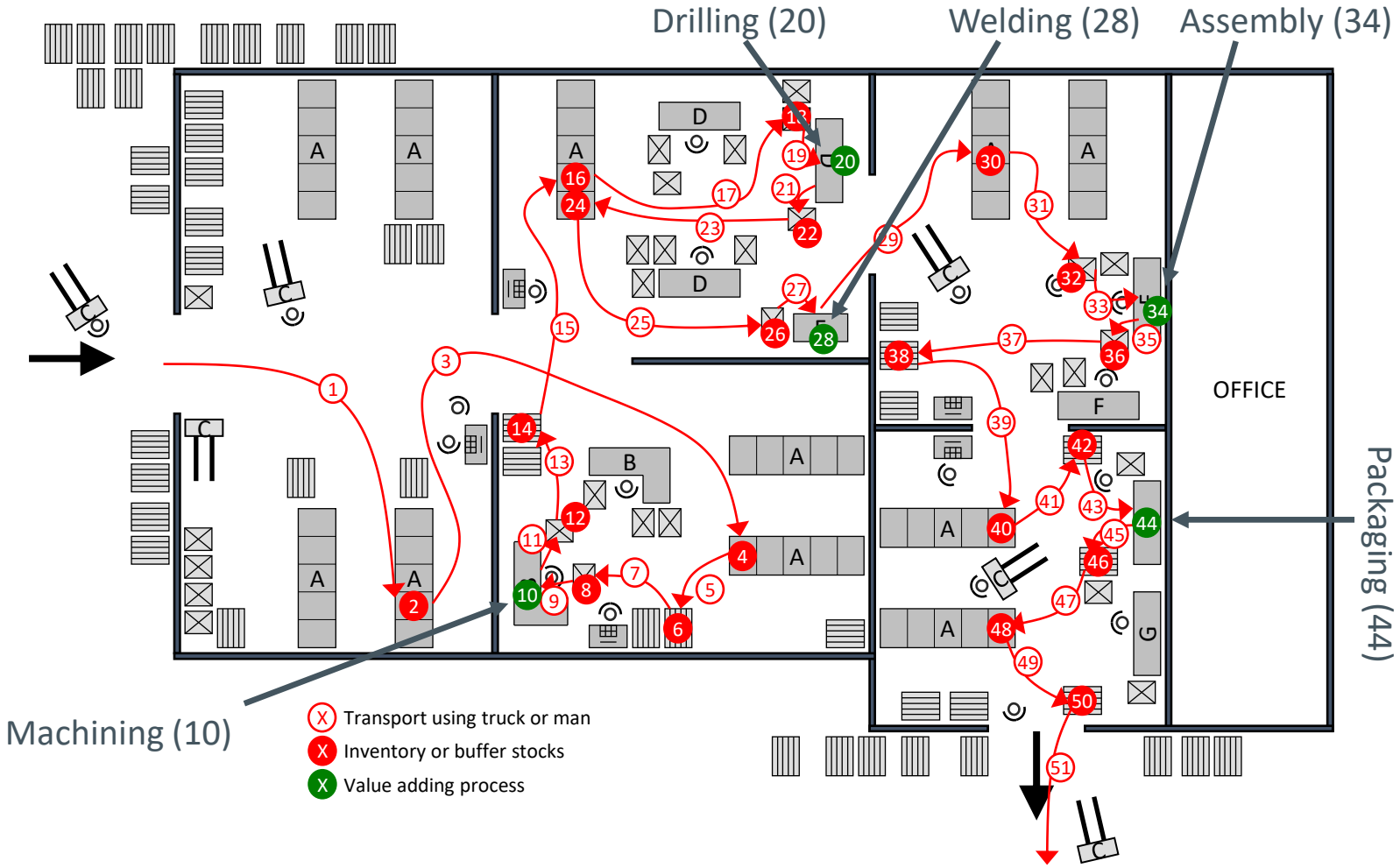
Minimum of conflicts
Suggest improvement
Open information and communication



Follow Instructions and way of working rules

Develope methods
Correct timesetting
Eliminate waste

MTM Base Line Lay-out



MTM Base

A Workstation Design Process

In the workstation design and implementation process, there is always an initial need to inform users and to organize the project so as to allow for full user participation and in order to increase the chance of full employee acceptance of the final result. A treatment of this goal is not within the scope of the present treatise, which concentrates on the problem of arriving at an optimal solution for the physical design of the workstation, but the design process nonetheless allows the integration of such a goal. In this process, the following steps should always be considered:

1. collection of user-specified demands
2. prioritizing of demands
3. transfer of demands into (a) technical specifications and (b) specifications in user terms
4. iterative development of the workstation's physical layout
5. physical implementation
6. trial period of production
7. full production
8. evaluation and identification of rest problems.

MTM Base

A Workstation Design Process

The collection of the user-specified demands should meet a number of criteria:

- *Openness*. There should be no filter applied in the initial stage of the process. All points of view should be noted without voiced criticism.
- *Non-discrimination*. Viewpoints from every category should be treated equally at this stage of the process. Special consideration should be given to the fact that some persons may be more outspoken than others, and that there is a risk that they may silence some of the other actors.
- *Development through dialogue*. There should be an opportunity to adjust and develop the demands through a dialogue between participants of different backgrounds. Prioritizing should be addressed as part of the process.
- *Versatility*. The process of collection of user-specified demands should be reasonably economical and not require the involvement of specialist consultants or extensive time demands on the part of the participants.

MTM Base

Musculoskeletal load variables

- muscular force demand
- working posture demand
- time demand.

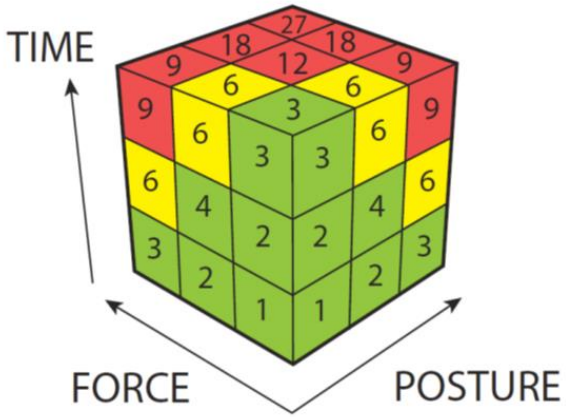
With respect to *muscular force*, criteria setting may be based on a combination of biomechanical, physiological and psychological factors. This is a variable that is operationalized through measurement of output force demands, in terms of handled mass or required force for, say, the operation of handles. Also, peak loads in connection with highly dynamic work may have to be taken into account.

Working posture demands may be evaluated by mapping (a) situations where the joint structures are stretched beyond the natural range of movement, and (b) certain particularly awkward situations, such as kneeling, twisting, or stooped postures, or work with the hand held above shoulder level.

Time demands may be evaluated on the basis of mapping (a) short-cycle, repetitive work, and (b) static work. It should be noted that static work evaluation may not exclusively concern maintaining a working posture or producing a constant output force over lengthy periods of time; from the point of view of the stabilizing muscles, particularly in the shoulder joint, seemingly dynamic work may have a static character. It may thus be necessary to consider lengthy periods of joint mobilization.

MTM Base

Sperling, L., Dahlman, S., Wikström, L., Kilbom, Å. & Kadefors, R. (1993). A cube model for the classification of work with hand tools and the formulation of functional requirements. *Applied Ergonomics,* 24 (3); 212–220.
Berlin, C and Adams C (2017) *Production Ergonomics: Designing Work Systems to Support Optimal Human Performance.* Pp. 49–64. London: Ubiquity Press.



Physical Loading = posture × forces × time

IMD-EWD: If we promote the use of the Cube model in combination with any MTM system, we can prevent many (probably a large majority) future workload injuries.
Usage: For every work task (on sequence level), we can make a quick assessment of the three factors. The teacher need some theoretical background, ch 3 in Berlin and Adams (2017) is good enough.
Disclaimers: The time factor must consider a larger work task or the whole workday. There may be other factors that will affect the risk as well, such as physical work environment, vibrations, and psychosocial factors.

MTM Base

Method deviation

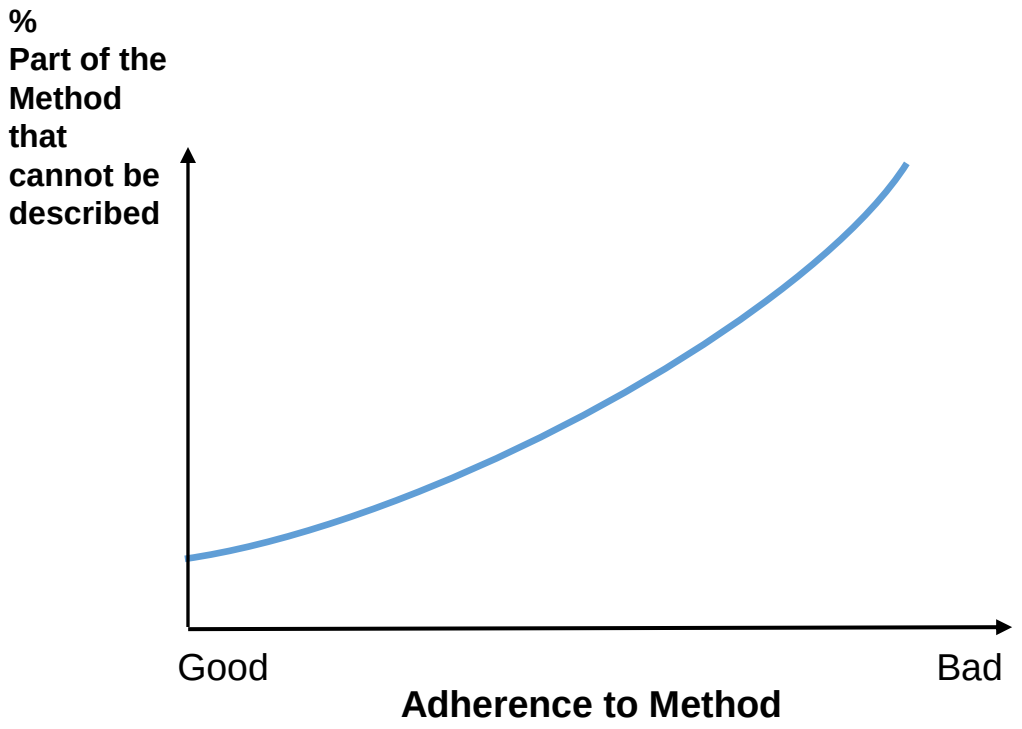
Motion sequence of an activity

Description
What to do?

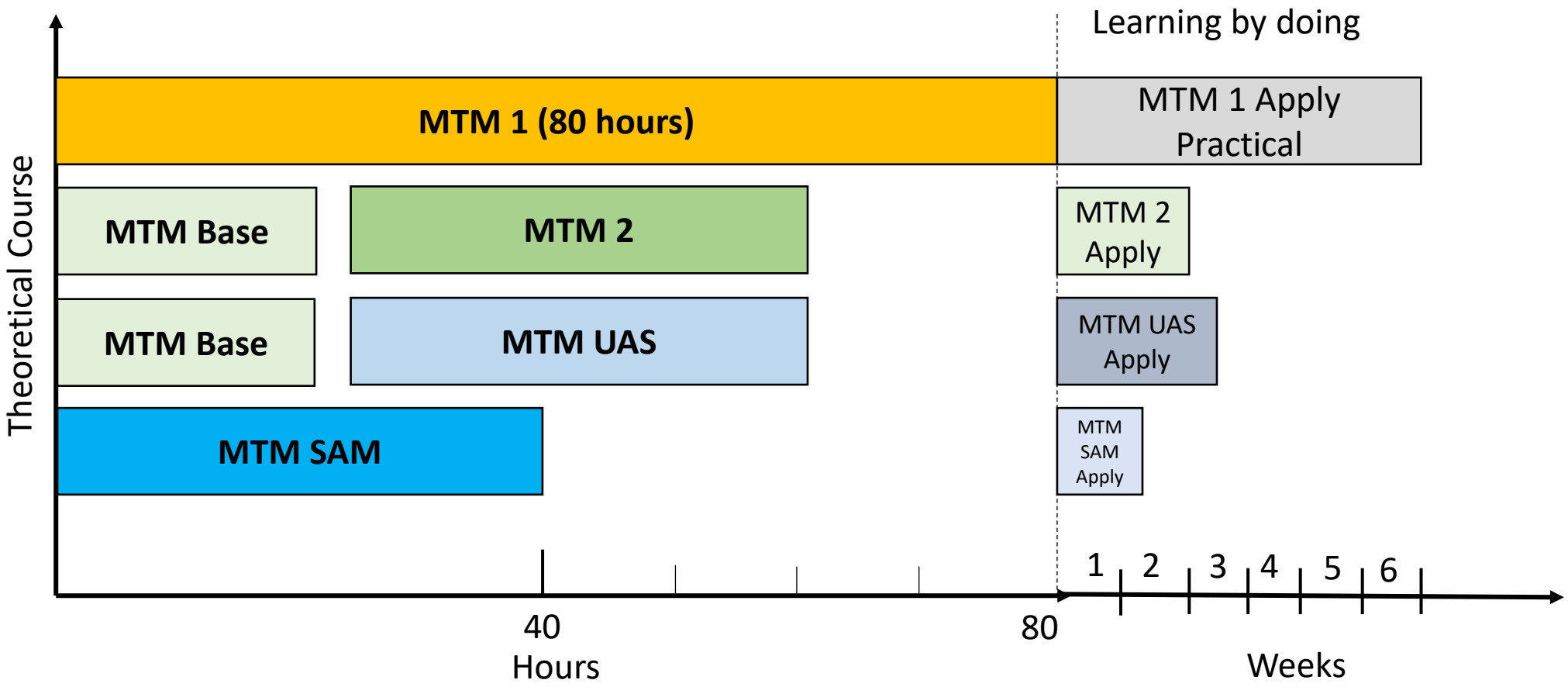
Assessment
How the method is followed?

Work Method

Individual operator Method



Learning curve for systems



MTM Base

Difference in Time to Analyse 1 minute work:

- MTM 1: 350 minutes
- MTM 2: 150 minutes
- MTM SAM 30 minutes
- STD 15 minutes

KPI.s for Productivity

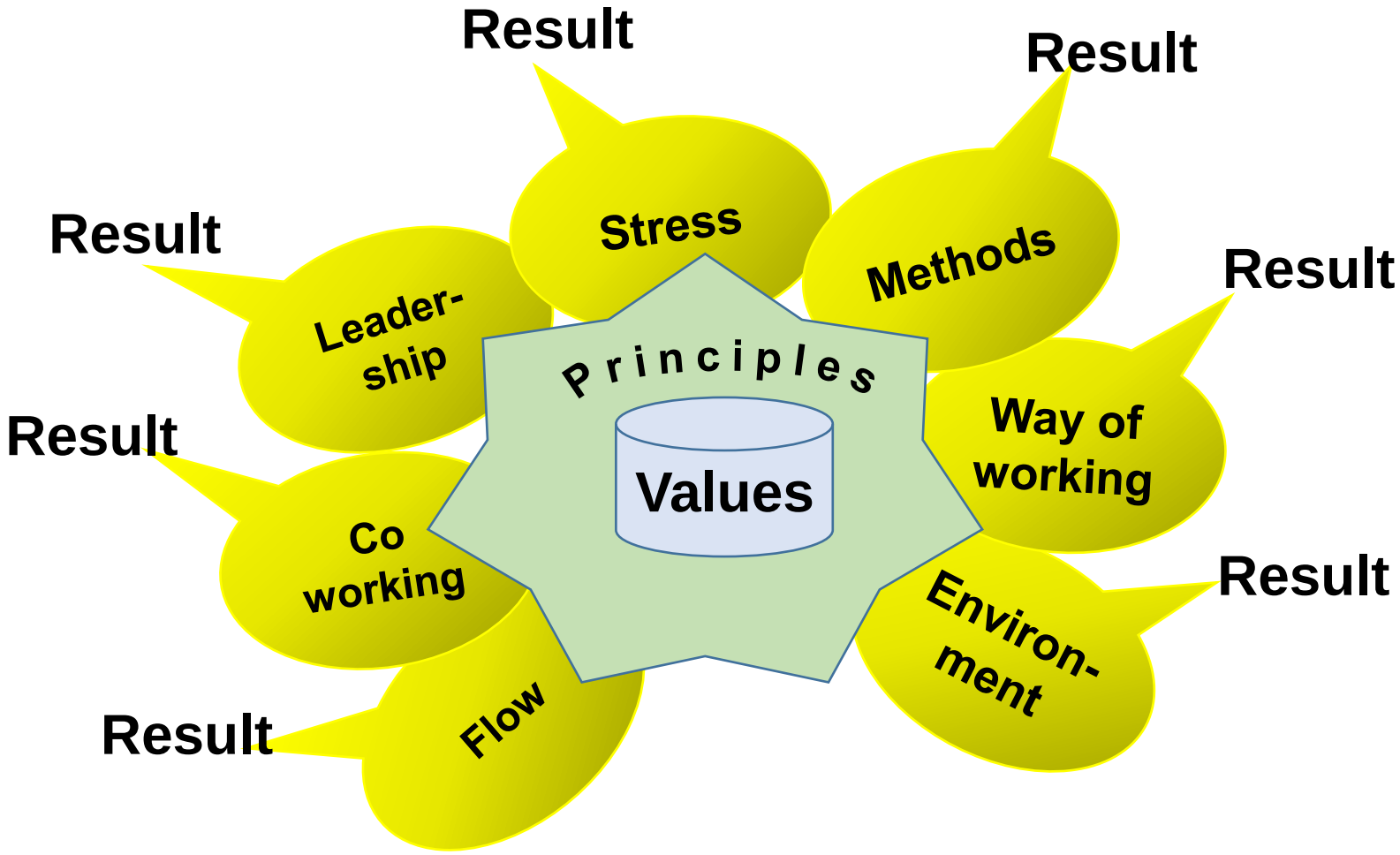
- Reduced man-hours
  - Method engineering
  - Work simplification
  - Set-up time
  - Change over time
- Employee number

- Value Added Hours
- Non Value Added Hours

- Overtime

- Total paid wages

Psycosocial Working Environment



MTM Base
IMD-EWD Values, Principles, Benefits

Our most important **values** are:

- Agility
- Unity
- Collaboration
- Integrity
- Inclusiveness
- Exellence

Benefits for Customers:

- Healthy and satisfied employees
- Increased Value Added Work
- Less losses
- Increased profitability
- Balanced flow in production

Our most important **Principles** are:

- Ethical Work Design based on ILO recommendations
- International Standard Systems and Tools
- Everything starts with People
- Uniform training material cross over the world
- We work honestly with each other and our community
- Non-profit community
- Measurable progress to our customers and users

MTM Base

We talk

- English
- French
- Spanish
- Turkish
- Swedish
- Finnish

MTM Base

Company Name

This company fulfill all criterias of

- Correct Timesetting due to PTS technics incl Logistics according to IMD-EWD
- Ethical and Fair Workstations based on ILO recommendations