Robotisation project

06/08/21

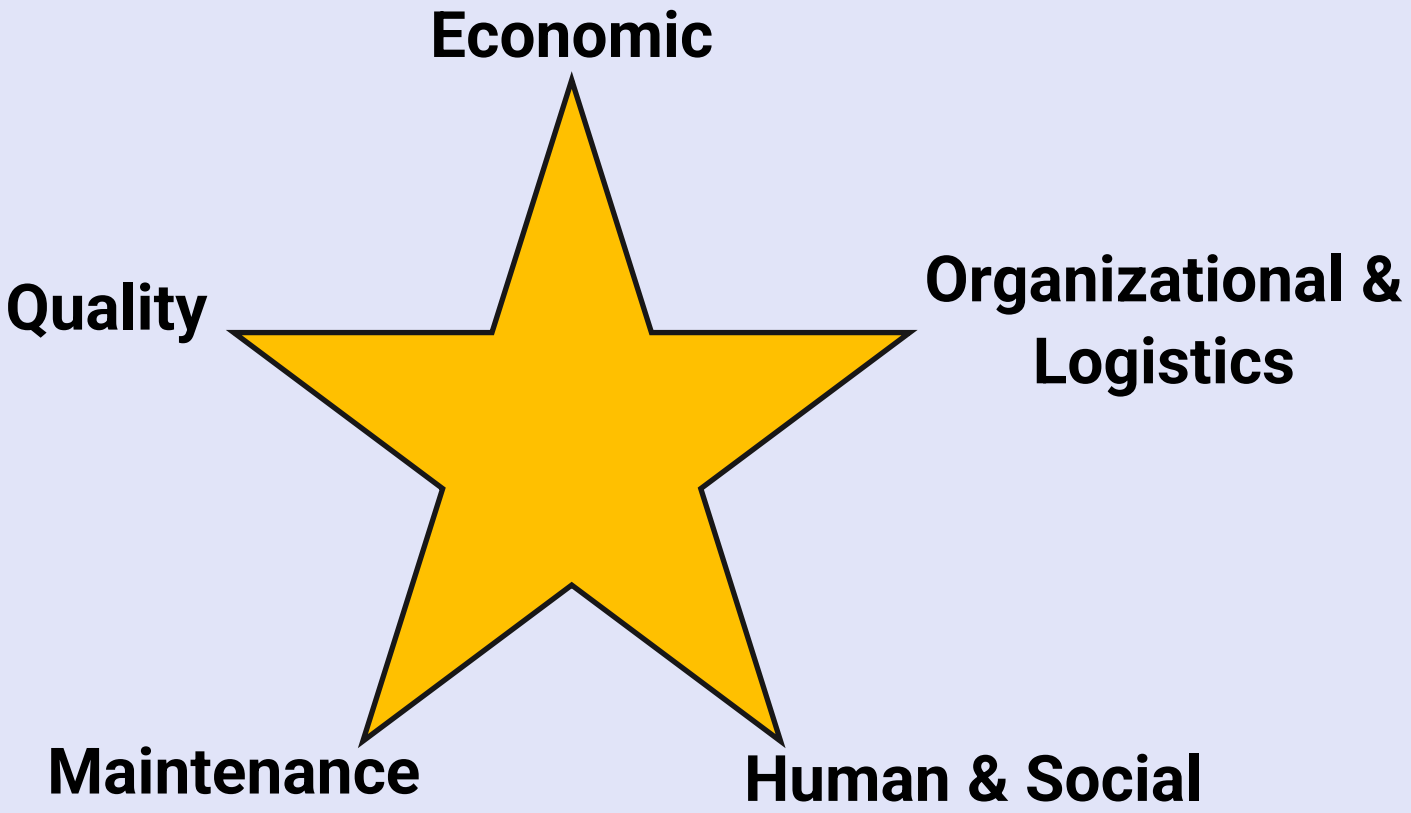
Objectives of the robotics methodology:

- Being able to perform a quick robotic diagnostic
- Being able to produce specifications that will be used for consulting integrators

Conduct of the course & expected work:

- 2 sessions of 3 hours
- Work in teams of 4/5 students
- Multiple-Choice Questionnaire at the end

5 factors influencing the methodology:



The 3 steps of the methodology

Methodology of Robotisation – First Step: The pre-diagnosis

Goals:

- Rapidly assess the relevance of robotics
  - Profitability
  - Impact on the human factor
  - Organizational/Logistic Impact

Make the decision whether to launch the robotics project or not

Methodology of Robotisation – First Step: The pre-diagnosis

STEP 1: Robot pre-diagnosis	
Clarification of customer need	
What?	
Who?	
Where?	
When?	
How?	

Client request

Cost-effectiveness assessment

Rapid evaluation of the project's profitability: 2021					
Elements of analysis	Current situation	Robotic situation	Comments		
Time range (dmh)			1dmh = 0,36s		
Number of pieces/year					
Scrap rate					
Cost price			Benefit = sale price (100$) - manufacture price (50$)		
Valuation			Detailed Calculation		
Load calculation (h)			Detailed Calculation		
Estimated gains per year ($)			Detailed Calculation		
			Hourly rate Thailand human	Hourly rate Thailand robot	Human (works with 5 over robots) + Robot
Scape gains			$7,30	$13,71	$15,17
Estimated expenses					

Methodology of Robotisation – First Step: The pre-diagnosis

Rapid evaluation of the human factor			
Elements of analysis	Mesure	Comments	
Radar Diagrams - Current Ergonomic Situation		Noise	6
		Lighting	8
		Joint position	7
		Posture	7
		Effort	6
		Working area	8
		Vision area	6
		Height of work surface	7
		Position Supply	6
		Repeatibility	8

ROI and human factor evolution

Organizational/ Logistic Impact

Impact organisationnel / logistique :					
	Rate	Temps inter-opératoire		Comments	
Upstream Station	Etching	1 minute			
Downstream Station	Storage	1 minute			
Is our station a bottleneck?		YES	NO		
Debrief:					
Is it interresting to roboticize thsi station after this first diagnosis?				YES	NO

This pre-diagnosis showed the value of robotic packaging. In just 3 years, would have realized the return on investment in the case of 40,000 speakers produced per year. This could be even faster in case of increase in the number of speakers produced. In addition, the company wants to be part of an innovative approach and move towards increasingly robotic production to continue to compete with large electronic companies and potentially diversify its products.

- Detailed job study and choice of a robotic solution

- In 6 parts:

  - Information Gathering
  - Detailed procedure
  - Analysis of cycle time
  - Principle solution and choice of robotic cell
  - Summary of the robotic project
  - Balance Sheet

➢ Example of cycle time analysis

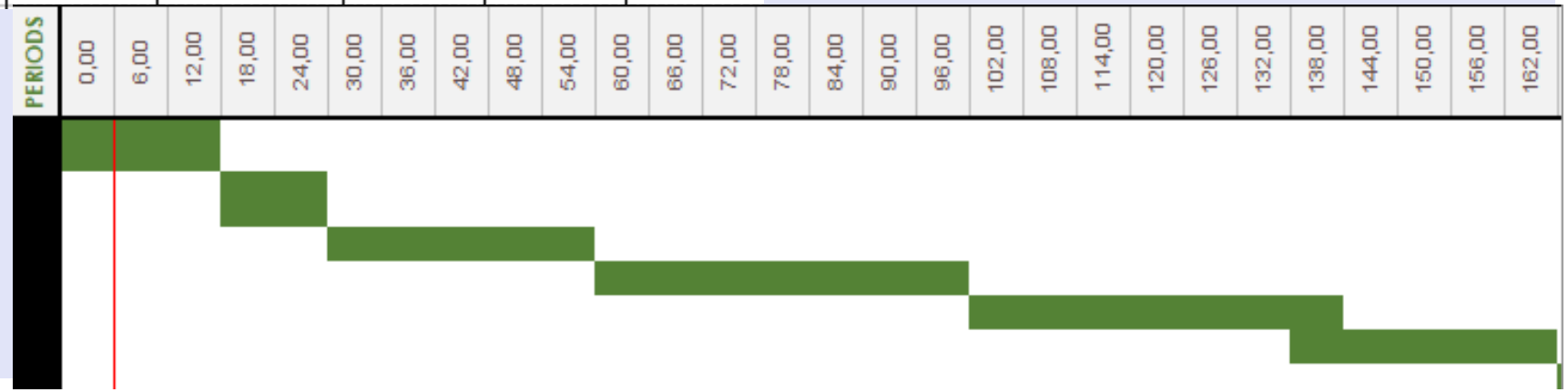
ID*	Items*	Task Duration (cmt/dmh)	Anteriority Task	Start Date	Finish Date	Type
1	Recovery of the lower speaker and placement on the support	14		0,00	14	Tm
2	Put the cable packing at the bottom of carton	14	1		28	Tm
3	Put the foam	28	2		56	Tm
4	Put the speaker in the foam	41	3		97	Tm
5	Put the cardboard lid	41	4		138	Tm
6	Storage box	28	5		166	Tm
7	Replenishment	28	6		194	Tm
8	Replenish with components	14	7		208	Tf

Manual Time : Tm

Technological time: Tt

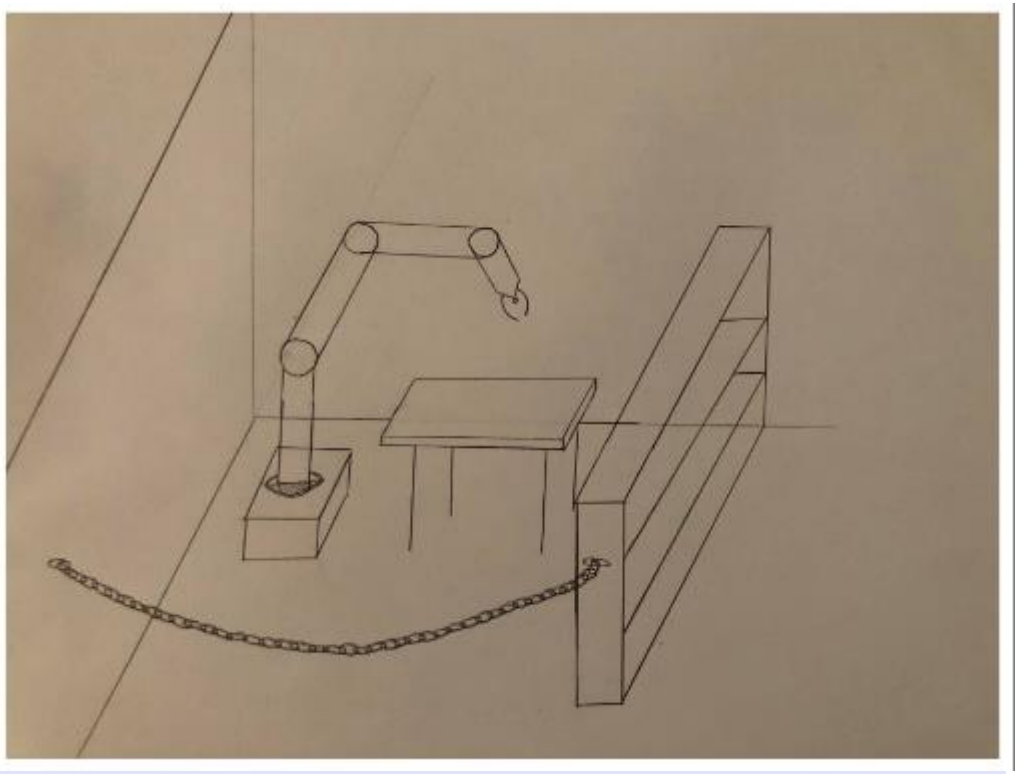
Frequency Time: Tf

Simogram :



Methodology of Robotisation – Second Step: The diagnosis

- Explain your proposed solution:
  - Materials
  - Technical solutions
  - Sketch



- Calculate the theoretical cycle times of your solution

Methodology of Robotisation – Second Step: The diagnosis

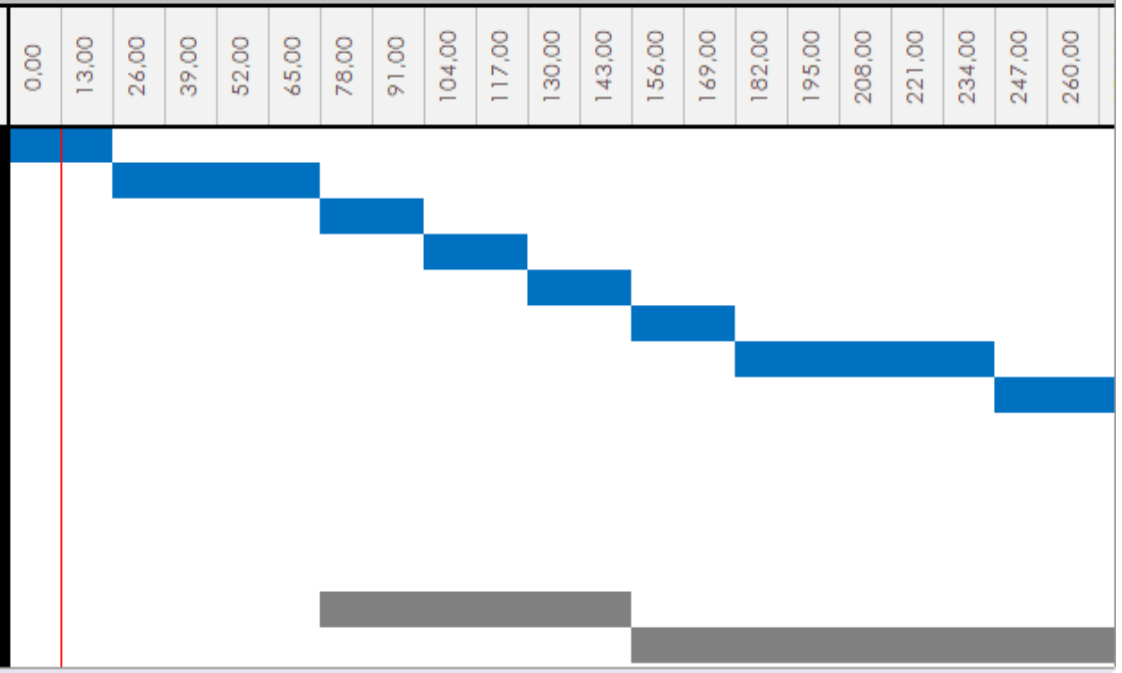
➢ Show your new cycle time

Simmogramme

EXPECTED CYCLE TIME : 512 mct/dmh

Type of time : Tm Tf Tt

ID*	Items*	Task Duration (cmt/dmh)	Anteriority Task	Start Date	Finish Date	Type
1	Recovery of the lower part of the speaker	14		0,00	14	Tt
2	Checking the direction of the piece, flipping	57	1		71	Tt
3	Position the lower part on the base	28	2		99	Tt
4	Retrieve the Cable Package	25	3		124	Tt
5	Remove the cable package to the lower par	22	4		146	Tt
6	Recover the foam	26	5		172	Tt
7	Put and press the foam in the lower part	67	6		239	Tt
8	Retrieve the speaker	40	7		279	Tt
9	Remove the speaker	47	8		326	Tt
10	Retrieve the upper part of the package	27	9		353	Tt
11	Remove the upper part of the package	51	10		404	Tt
12	Retrieve the entire package	33	11		437	Tt
13	Pack and place the package in stock	75	12		512	Tt
14	retrieve the speaker and store it	83	2		153	Tf
15	Replenish with components	170	14		322	Tf



Methodology of Robotisation – Third Step: Specifications

- Allow consultation of specialized robot integrator
- 5 parts:
  - Project Description
  - Technical data
  - Purchase data
  - Training, Maintenance, and Warranty
  - Planning

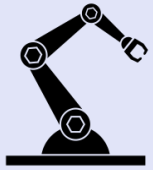
➢ The 10 objectives of the robotics methodology:

- Project planning stages
- Preparation of the specifications
- Consultation
- Analysis of integrator offers
- Exchange, negotiation and choice
- Order validation cost and deadlines
- Design and development of the robotic cell
- 1st reception at the integrator (specification compliance check)
- Disassembly and delivery of the robotic cell
- Final factory acceptance
- Start Series

➢ A. Technical data

➢ Summary of diagnostic information on:

The cycle times



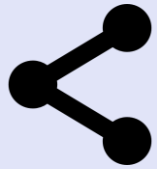
The robotic solution chosen

➢ Definition of technical conditions:

PAD

On/Off

Standards



Peripheral Communication

Methodology of Robotisation – Objectives of robotics methodology

B. Trade data

Purchase price/purchase condition

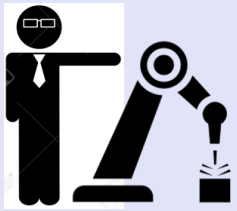
Consumable prices

C. Training, Maintenance, and Warranty

Price for spare parts

Define the service conditions

Define the guarantee conditions



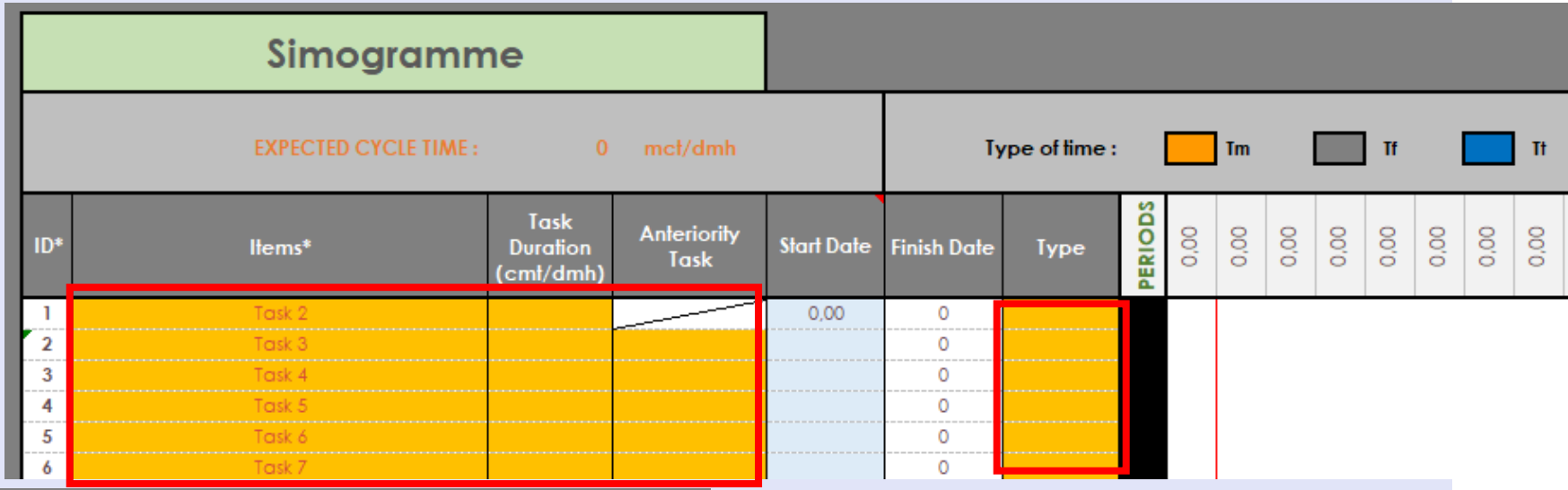
Training of the team

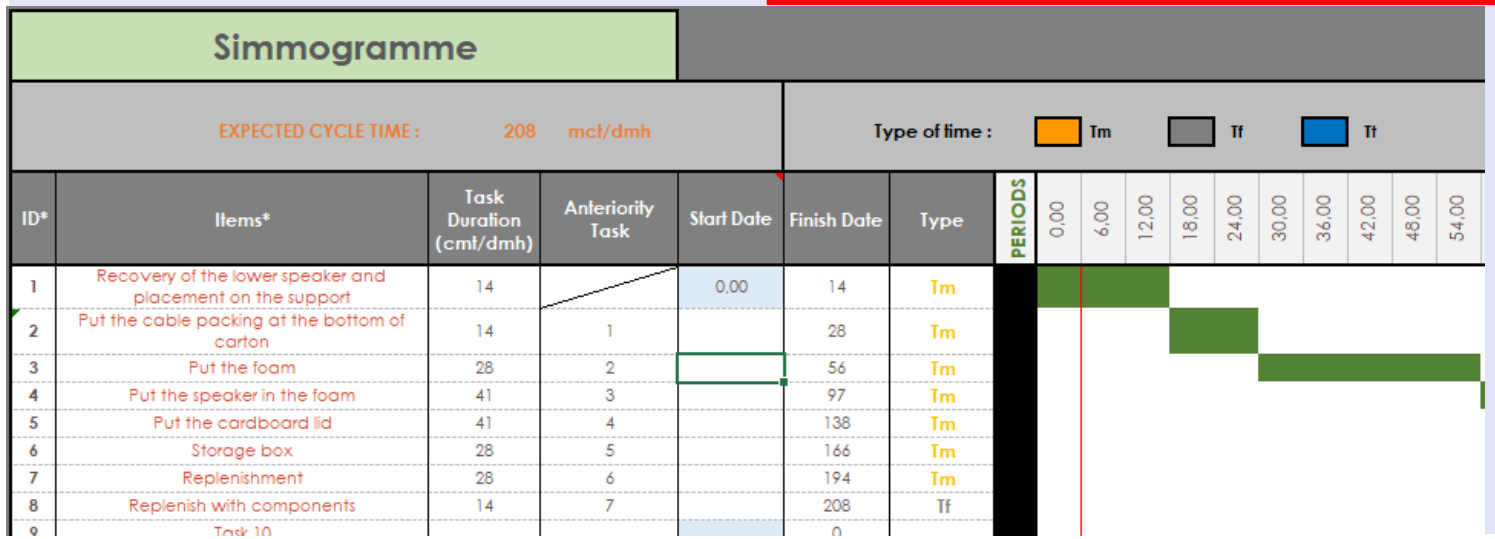

Latest
generation
Staubli robot
to pack the IOT
product

Methodology of Robotisation – Supportive documentation

2 versions:

A student version to be partially completed





A teacher version serving as a key

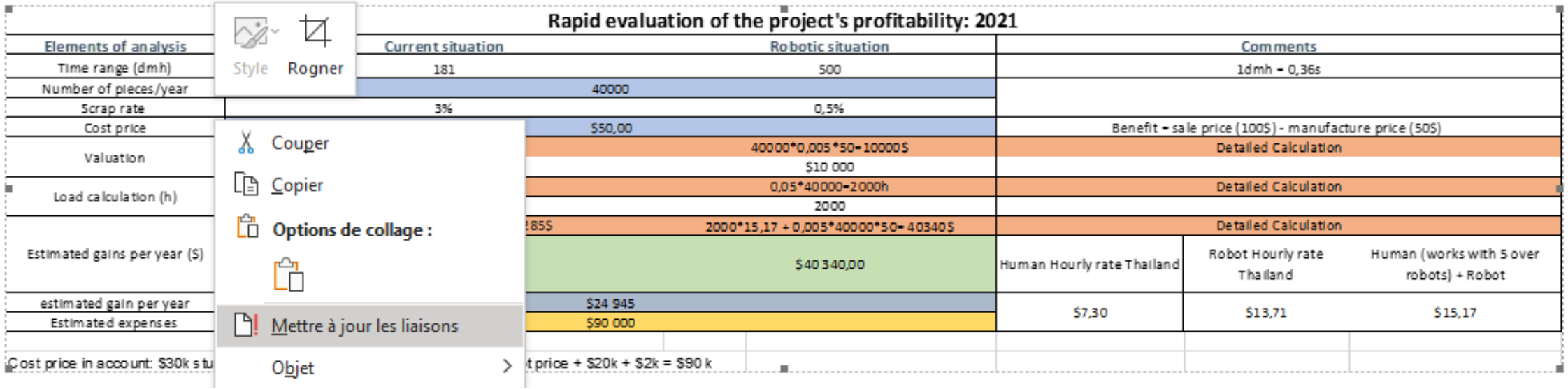
Methodology of Robotisation – Supportive documentation

A word document, for the rendering of the group work

There are links to the excel, to update it, just do:
-> right click on the image -> update the link

TRAINING CENTER

Cost-effectiveness assessment



Rapid evaluation of the project's profitability: 2021

Elements of analysis	Current situation	Robotic situation	Comments		
Time range (dmh)	181	500	1dmh = 0,36s		
Number of pieces/year	40000				
Scrap rate	3%	0,5%			
Cost price	$50,00		Benefit = sale price (100$) - manufacture price (50$)		
Valuation		40000*0,005*50=10000$	Detailed Calculation		
		$10 000			
Load calculation (h)		0,05*40000=2000h	Detailed Calculation		
		2000			
Estimated gains per year ($)	85$	2000*15,17 + 0,005*40000*50= 40340$	Detailed Calculation		
		$40 340,00	Human Hourly rate Thailand	Robot Hourly rate Thailand	Human (works with 5 over robots) + Robot
estimated gain per year	$24 945		$7,30	$13,71	$15,17
Estimated expenses	$90 000				

Cost price in account: $30k s tu | t price + $20k + $2k = $90 k

There is also a powerpoint addressing the notions of classes and a kahoot to make a summary of the knowledge to be retained

+

Kahoot!

https://kahoot.it/challenge/?quiz-id=236d2bdb-300d-4ad8-be7a-e79f0baa2140&single-player=true

Thanks for your attention