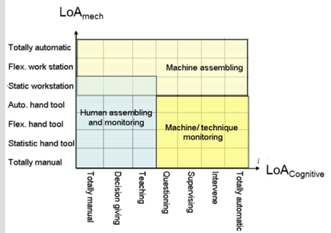
LoA – Levels of Automation

Levels of Automation is defined as:
the allocation of physical and cognitive tasks between resources (humans and technology), described as descrete steps from 1 (totally manual) to 7 (totally automatic), forming a 7 by 7 LoA matrix containing 49 possible types of solutions.

Physical automation is defined as:
technical solutions helping the oprerator to assembly the products e.g. *WITH WHAT* to assemble.

Cognitive automation is defined as:
technical solutions helping the operator e.g. *HOW* to assemble (Levels 1–4) and situation controls (Levels 1–7).

LoA matrix



CXI – Complexity Index

CXI describes how the operator perceive the work station. It is based on self-assesment through a questionaire consiting of 24 questions. The questions are distributed on six main categories concerning:

- **product variants**
- **work contant**
- **layout**
- **tools and support tools**
- **work instructions**
- **general view**

The categories and overall CXI are ranked between 1–5.

CXI matrix

CXI	CXI level	Colour	Action
<2	Low	g (green)	No investigation needed
≥ 2 - <3.5	Moderate	y (yellow)	Need investigation
≥ 3.5	High	r (red)	Need urgent investigation

What is what?

Stations

1. Electronics
2. Assembling
3. QA – Quality Assurance
4. Packaging
5. Mix of different stations to be able to produce
6. What type of station the product is at right now

Workers

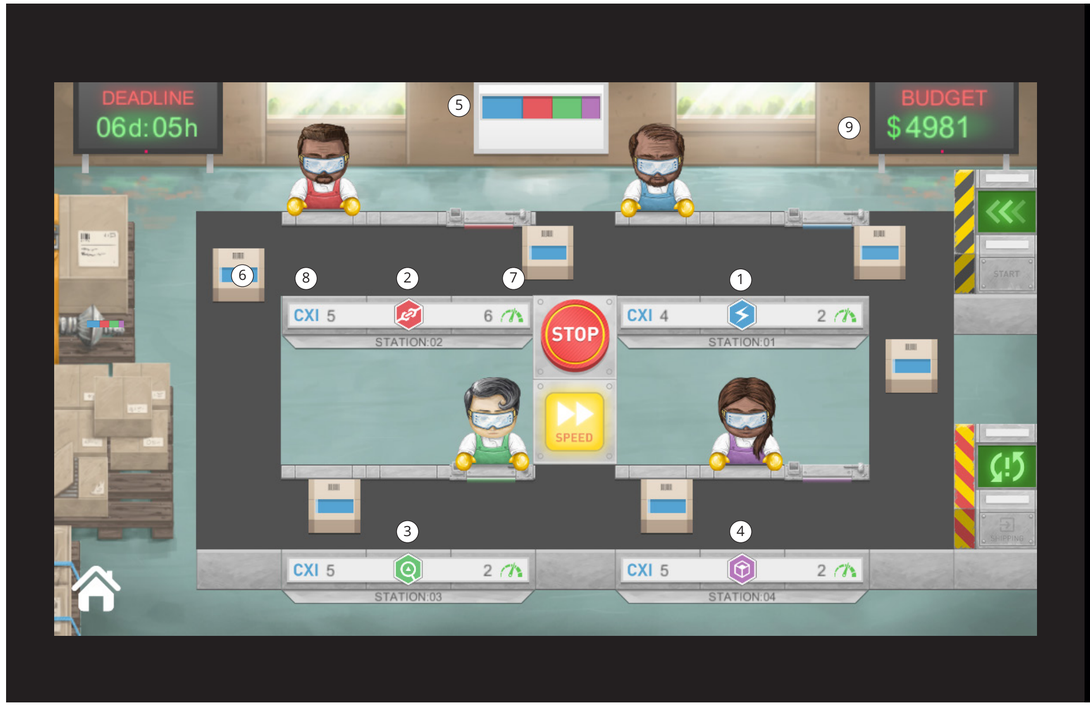
- Education, level 1–5

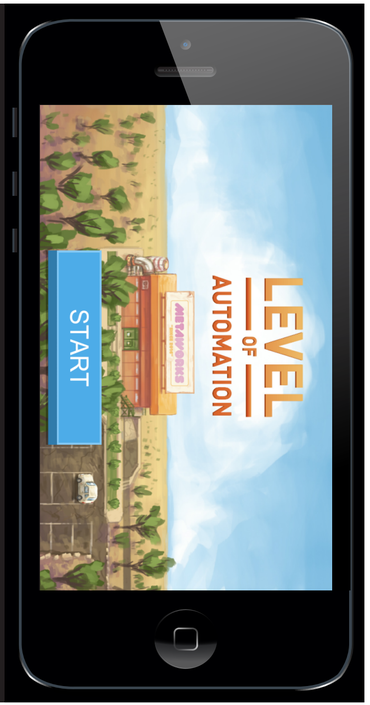
Tools

- LoAc – cognitive automation
- LoAp – physical automation
7. Efficency, level 1–300

Score

8. CXI – Complexity, level 1–5
9. Cost
- Quality

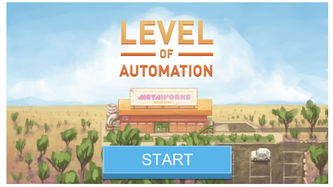




Human centered automation

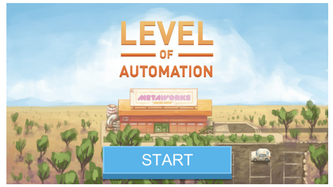
Human Centered Automation aims to create automation solutions to support humans, not the other way around.

Automation strategies should contain both physical and cognitive automation solutions to support humans, but the choice of different automation strategies could affect the operator in different ways and how she perceive the surroundings. If there are too many different tools the perceived complexity could increase, if you choose too high cognitive automation the operator don't get to use their creativity and flexibility which could be perceived as negative.



The story

You take the role as a production engineer. You are in charge of developing a system that could maximize production and profit.



Your mission

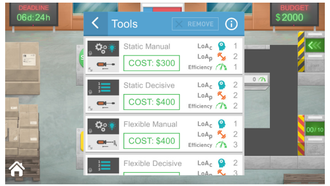
Your goal is to complete all products before time runs out and to accomplish this you need suitable workers and tools.

Pick your team

You need to balance workers and tools between different stations in terms of efficiency and CXI. You can choose between different levels of automation and also different operators with different education levels (if you educate them, the efficiency increases and they are better to handle many different tools).

Workers

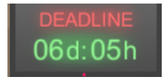
Tools



Go!

You have three different screens to supervise;

1. **Deadline screen** – you have one week to produce the products at each level.



2. **Budget screen** – spending too much money results in bad cost score.

3. **Product checker** – if a product is finished it will pass through and the completion counter will increase. More product will be produced when you are getting to run a bigger factory. The packages will have different colors depending on which station to be assembled at. It will change when the product time is done, it might not be done the first time, it depends on the efficiency chosen by you!

How you score

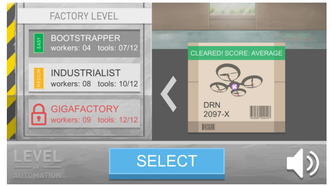
To get good score you need to think carefully about how many workers your hire and what tools you pay to complete the task. Balance is the key! You will be evaluated in CXI, Cost and Quality.

CXI COST QUALITY

Next level

You have totally three different factories to run with three different products at each level. For every level you get more workers and tools to choose from, the different stations also increases so be careful how to choose the tools and workers.

Factory levels



THE LEVEL OF AUTOMATION – THE GAME

This game is for production engineers who wants to see how levels of automation and competence of operators affect quality, cost and the work environment of the operator!

Download The Level of Automation for free at App Store and enjoy it on your smart phone or tablet.

MOBILE STORYTELLING

CHALMERS PRODUKTION2030

Med stöd från: VINNOVA Energimyndigheten STRATEGISKA INNOVATIONSPROGRAM