

Learning factories in partner institutions

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MIGUEL ALTUNA LHII

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Agenda

- Collaborative learning factory
- Learning Factories (in order of appearance)

- CMQ (France)
- SANTURTZI LHII (Basque Country)
- ARMERIA LHII (Basque Country)
- GETKIM VET (Türkiye)
- DHBW (Germany)
- MADE (Italy)
- TOLOSALDEA LHII (Basque Country)
- CAMOSUN (Canada)

LCAMP Collaborative Learning Factory

Learner Centric Advanced Manufacturing Platform

What is a Learning Factory?

“a close-to-reality factory environment for education, training, and research purposes, which enables experiential learning in a realistic industrial setting." (Abele et al., 2017)

What is the LCAMP Collaborative Learning Factory?

Physical environment with learning purposes that recreate the entire value chain to produce a product with the closest similarity to reality and **with specific features to enhance collaboration.**

General features of the LCAMP collaborative learning factory

- A semi-industrial learning environment
- Allows integration of I4.0 technologies and infrastructures in education facilities
- Multiple disciplines co-work in the same LF
- Enables the collaboration between geographically separated VET centres

LCAMP Collaborative Learning factory

LCAMP
Learner Centric Advanced Manufacturing Platform

LCAMP Collaborative Learning Factory

1 Define User

2 Technological Solutions

3 Define the CLF product

4 CLF process & operative

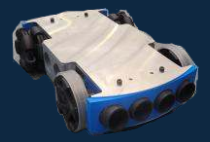
5 Collaboration

Students from:

- Production management
- Mechatronics
- Design of products and processes
- Automation and robotics
- Industrial IT
- Others…..

- IoT infrastructure, communications
- Automation
- Lean manufacturing, work organization
- Data analytics and exploitation, IA,
- Digital assistance technologies, Digital twins, VR/AR solutions
- Sustainability
- Eco design, product life management

- Specifications
- Technical documentation
- Functionalities



- Nº of Workstations
- Lay out
- Manufacturing systems
- Work organization
- Operative

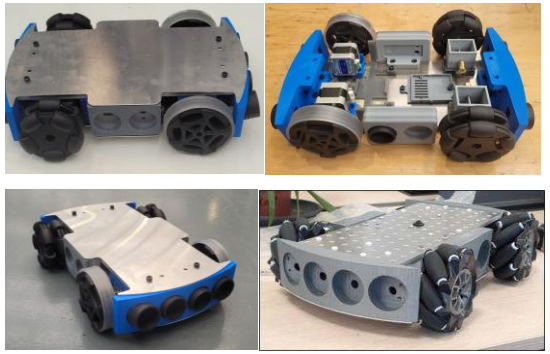
- Interdisciplinary courses
- Regional collaboration
- International collaboration

6 Learning activities, courses, microcredentials

LCAMP – Collaborative Learning Factory

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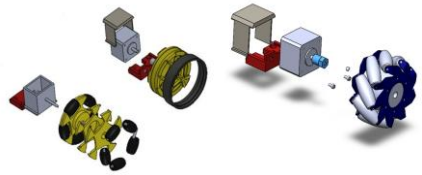
LCAMP product



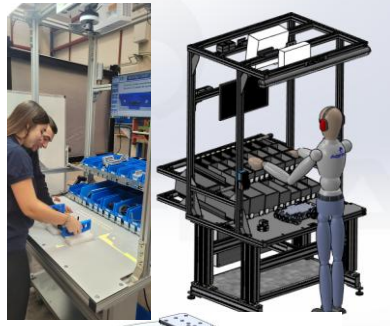
LCAMP Collaborative Learning Factory

01 work-station
Wheels assembly

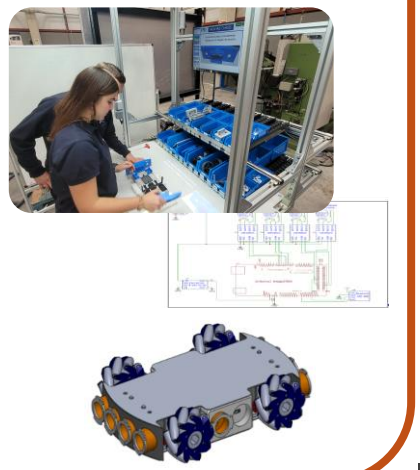


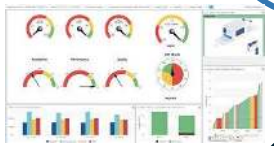


02 work-station
Chassis assembly



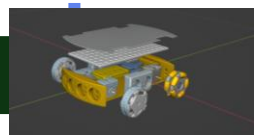
03 work-station
Final assembly





FORCAM
smart factory experts

IoT infrastructure-MES – Digital twin



SIMUMATIK

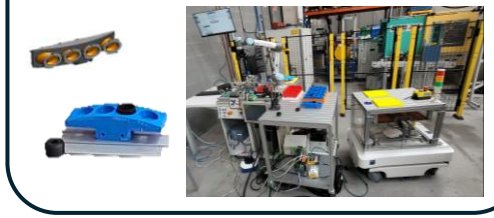
Work-Station
Machining



Work-station
3D printing



Work-stations
Sensor assembly

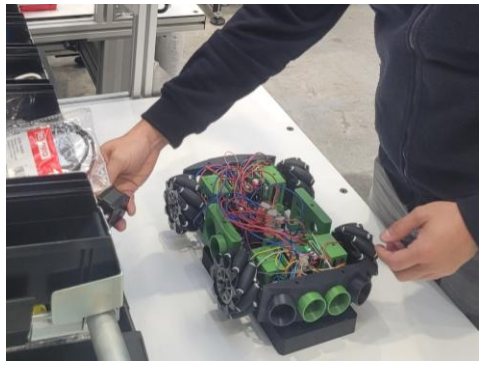


Morphology of the LCAMP CLF
https://lcamp.eu/wp-content/uploads/sites/53/2024/12/D6-1_Part-2-Morphology-of-the-CLF-v-1.0.pdf









Example of Collaborative Learning Factory implementation at Miguel Altuna LHI's facilities (Basque Country)

Assembly cell

Examples of Learning factories in partner institutions

- CMQ (France)
- SANTURTZI LHII (Basque Country)
- ARMERIA LHII (Basque Country)
- GETKIM VET (Türkiye)
- DHBW (Germany)
- MADE (Italy)
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CAMPUS
DES MÉTIERS
ET DES
QUALIFICATIONS
D'EXCELLENCE
Industrie du futur
Occitanie

LYCÉE la Découverte
DECAZEVILLE

COLLABORATIVE LEARNING FACTORY

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European project officer

BELMON Christophe
Teacher



WWW.CMQINDUSTRIEDUFUTUR.COM
WWW.DECOUVERTE.MON-ENT-OCCITANIE.FR

CMQE If's CLF

WHO WE ARE

LCAMP
Learner Centric Advanced Manufacturing Platform

CAMPUS DES MÉTIERS ET DES QUALIFICATIONS D'EXCELLENCE
Industrie du futur Occitanie

CMQE If

The CMQE If is a training cluster aimed at developing and promoting vocational training in the Industry 4.0 sector.

Promote industry careers and training

Build successful pathways for all

Support professional entry

Develop international openness.

LA DÉCOUVERTE

LYCÉE la Découverte DECAZEVILLE

La Découverte high school offers **general**, **technological**, and **vocational** programs ranging from EQF levels 3 to 5.

For industrial vocational training, the following fields are covered: **mechanical production, industrial boiler making, Europlastic, plastic and composite , and sciences industrielles de l'ingénieur**

CMQE If's CLF

OUR CLF

Our Collaborative Learning Factory is an immersive training space for our students, combining numerous manufacturing processes and Industry 4.0 technologies.

WHERE

LA DECOUVERTE HIGH SCHOOL In Decazeville (Occitanie Region)

WHO

STI2D students (Science and Technology of Industry and Sustainable Development) EQF 4
And more !

WHEN

Starts in September 2025

HOW

Multidisciplinary teaching team (EQF levels 3-4-5)





CMQE If's CLF

WHAT WE DO

CAMPUS DES MÉTIERS ET DES QUALIFICATIONS D'EXCELLENCE
Industrie du futur
Occitanie

LYCÉE la Découverte DECAZEVILLE



PARTS

All parts of the robot are produced in-house, except for the electronic components



PROCESSES

- CNC milling (3, 4, 5 axis)
- CNC turning (2, 3 axis)
- Wire EDM
- Sinker EDM
- 3D printing
- Laser cutting



TECHNOLOGIES

- Arkite
- Arduino communication
- Multi-signals
- Later : Kanban + Lean

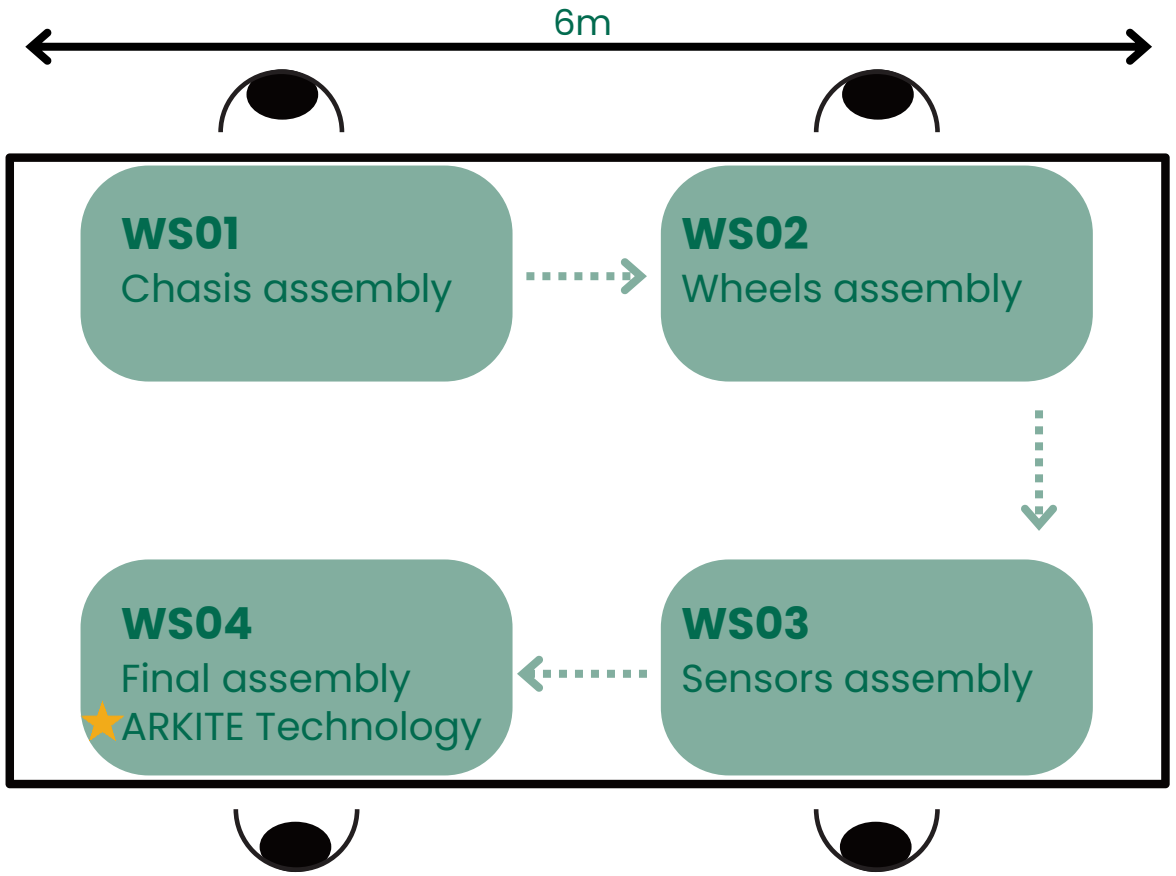


MATERIALS

- Steel & Alloy steel (low & high)
- Aluminum alloy
- Copper
- Graphite
- Plywood
- Plastic material (PE, PP)

CMQE If's CLF

LAYOUT



WS05
3D Printing lab

WS06
Machining lab



Our Collaborative Learning Factory with 4 workstations for the assembly



Final assembly workstation with ARKITE system

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Industrie du futur
Occitanie

LYCÉE la Découverte DECAZEVILLE

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2025-05-13

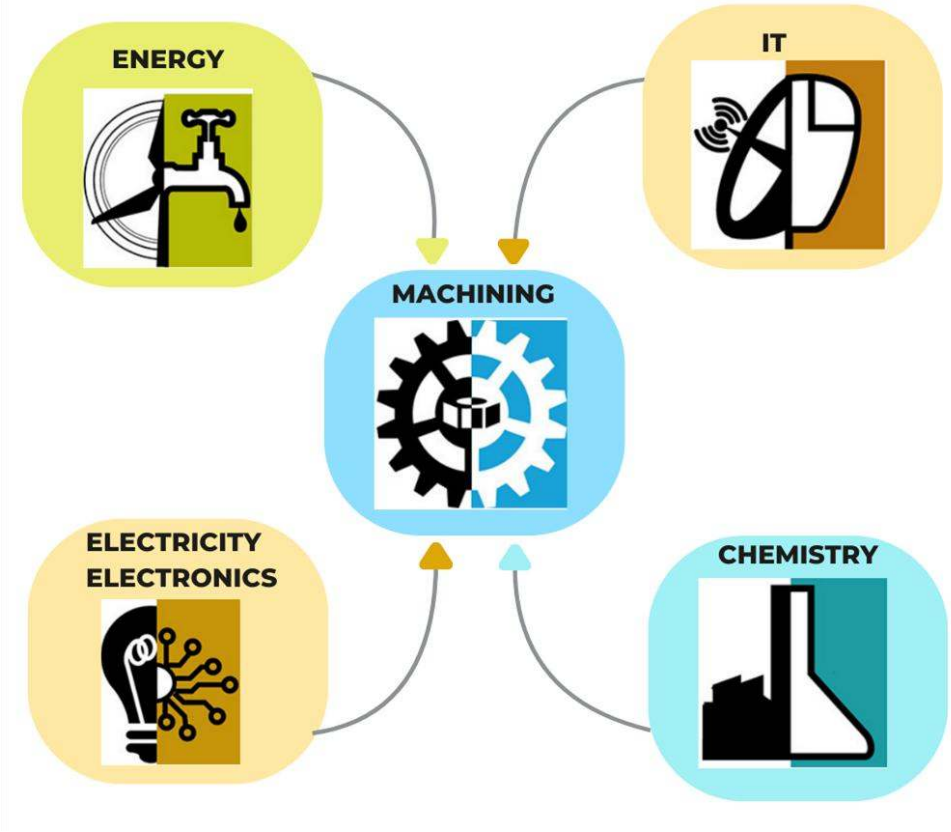
LHFP

SANTURTZI

Santurtzi´s Learning Factory

A Strategic Innovation for Our Center, 4 main goals

- Creating **interdisciplinary collaboration**



- **Real-world** industrial learning environment with students.
- Working with **projects** (ETHAZI)
- **Integrating cutting-edge technologies**
  - IA-BIG DATA
  - Grenn Hidrogen Energy Generation
  - 5G instalations

Learning Factory and IT: Key Areas of Implementation



- **Machine Usage and Control Management System**: control access,monitor machines (status real-time data), and ensure safe operation (checklist)
- **Maintenance Management Application**: preventive and corrective maintenance.
- **Intelligent Assistant:** providing students real-time technical information guidance,
- **IIoT Platform for Machine Monitoring:** collect and analyze real-time machine data for better decision-making.

LHFP SANTURTZI

Green Hydrogen Generation to Power 5G Radio Telecommunication Equipment



TELKI:

- Small-scale green hydrogen generation **laboratory**
- Designed as an **educational tool**
- Demonstration of electricity production using **green hydrogen**.

Two key approaches:

- **Collaboration with local entrepreneur**
  - Innovative patented communications broadcasting center
  - Access to advanced devices and equipment
- **Installation virtualization:** creating connection and disconnection exercises for other schools



5G Equipment





ESKERRIK ASKO!

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ARMERIA LEARNING FACTORY

LCAMP conference 2025

Finspang (SE)

ArmeriaEskola^{x}

The Learning Factory is structured into two areas

- Component production area



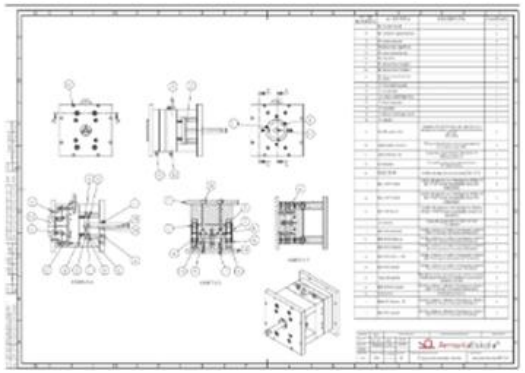
- Automated assembly line

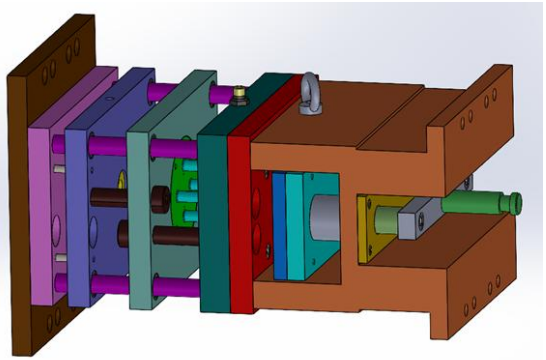


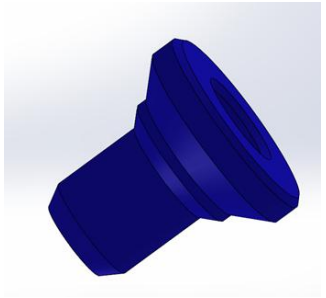


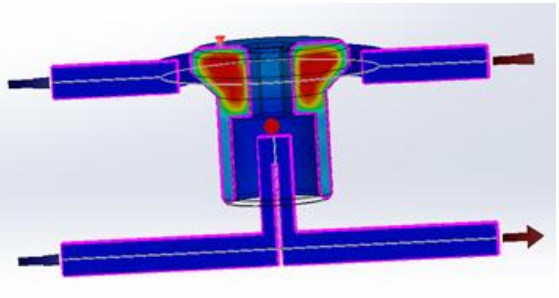
Study programs and main topics covered (2025)

- Design (EQF5)

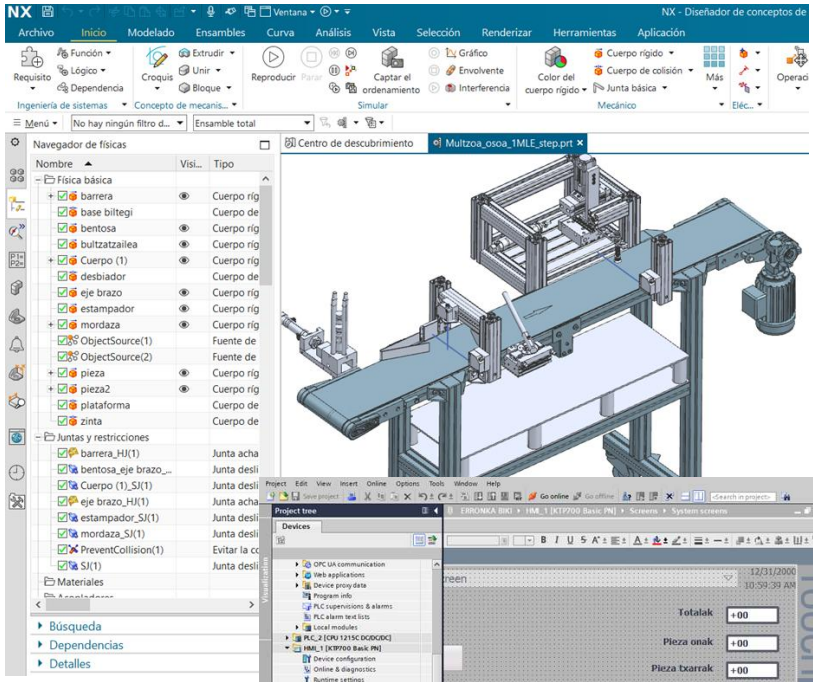


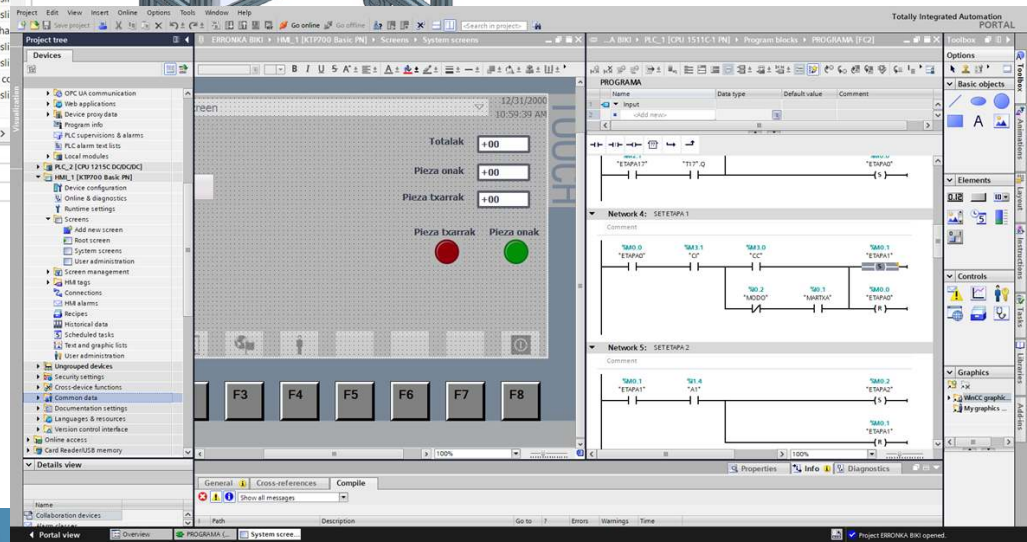






- Mechatronics (EQF 5)





Study programs and main topics covered (2025)

- Robotics (EQF5)

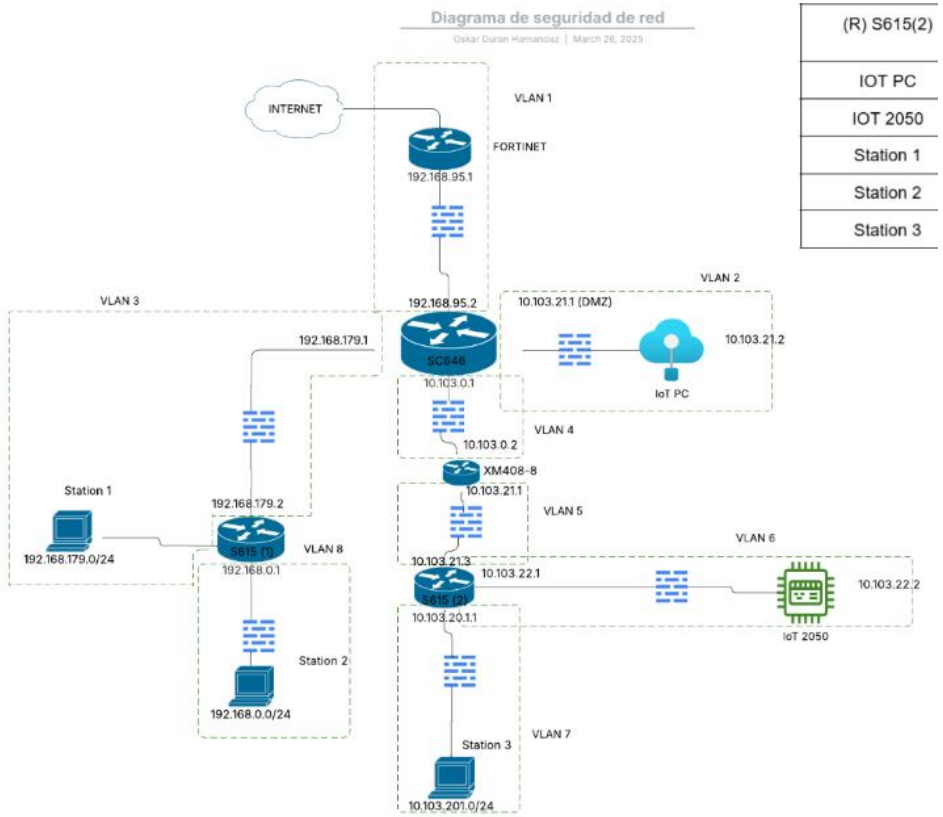






Study programs and main topics covered (2025)

- Industrial digitalization (EQF5)



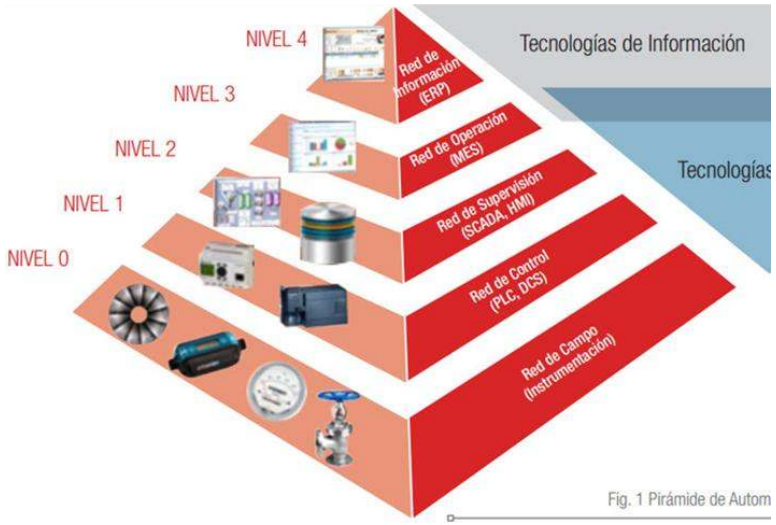
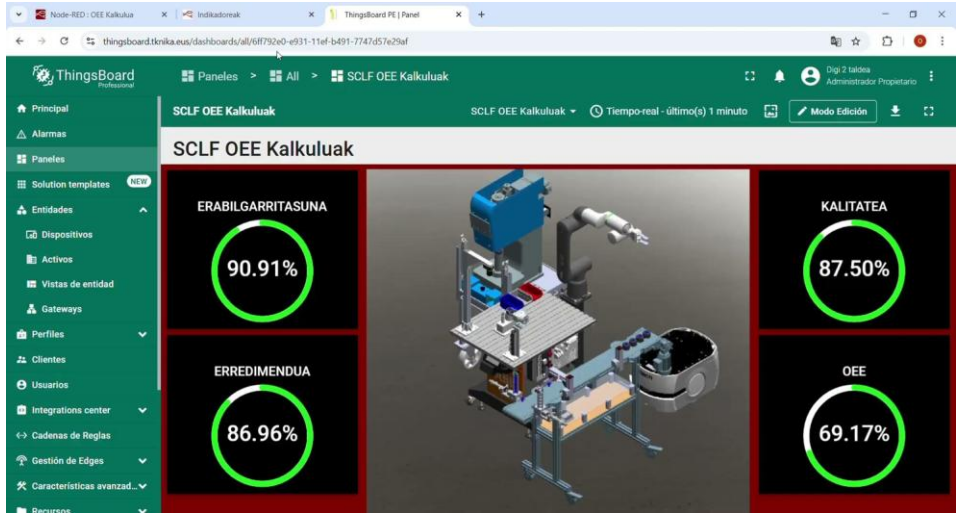


Fig. 1 Pirámide de Autom



Study programs and main topics covered (2026)

- Machining (EQF5)



- Metrology (EQF5)



Future objectives and collaboration opportunities

- Evolve from a didactic to a real product
- Add a key technologie by study program and academic year
- 1 week learning mobilities of small student groups (±6 students)

Study programme (EQF5)	Topics
Design	Plastic injection molding, punching and die cutting, tool and mold design, simulation and virtual validation
Machining	CAM, CNC milling, turning, EDM, grinding
Metrology	In-process metrology, coordinate measuring machine (CMM), contact profilometer, structured light scanning
Mechatronics	Digital twin, smart sensors (IO-link), safety
Robotics	Industrial and collaborative robotics, machine vision, bin-picking, machine tending, machine vision, motion control, AMR
Industrial digitalization	Industrial comunications, condition monitoring, KPI dashboards, MES/ERP, blockchaine

ESKERRIK ASKO

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ArmeriaEskola[x]

Collaborative Learning Factory in GEBKİM VET

Metehan GÜLLÜ
Abdullah GÖÇER

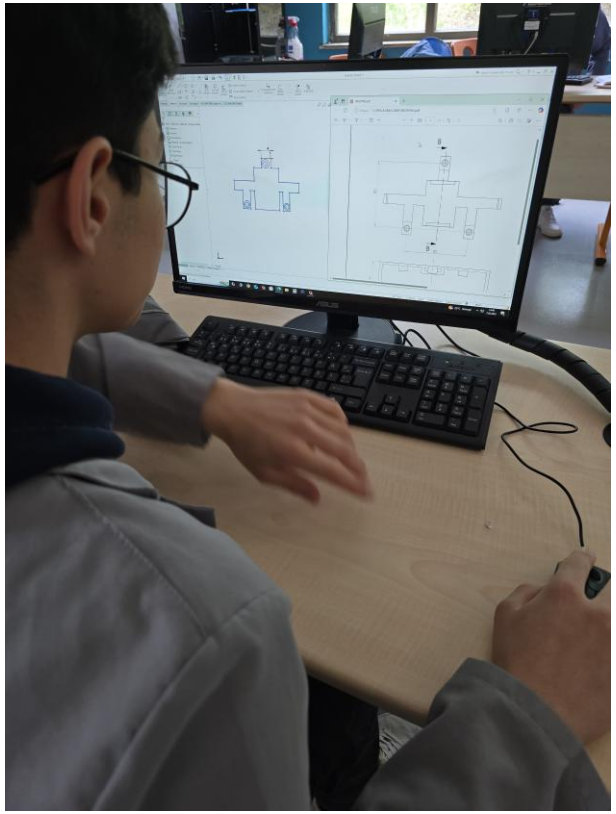
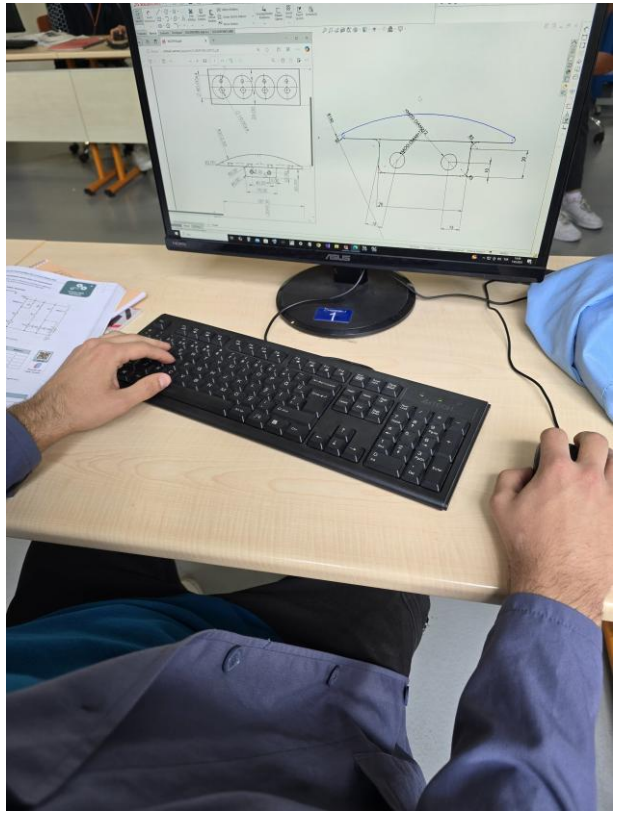
Introduction

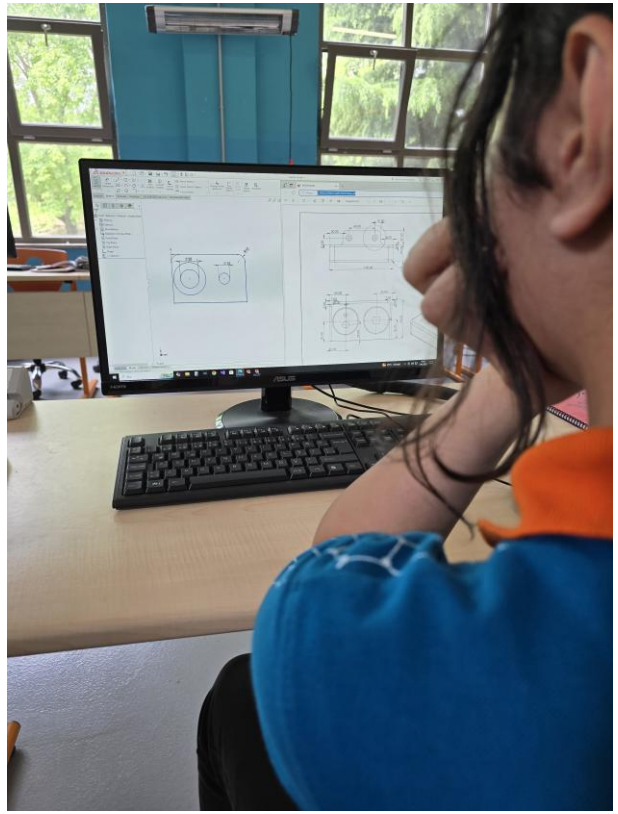
- Collaborative Learning Factory (CLF) studies carried out in our institute within the scope of LCAMP Project WP6 are carried out under the following headings;

- 1-) 3D Designing Studies
- 2-) 3D Printing Studies
- 3-) Manual Assembly Implementations
- 4-) Courses for CLF

3D Designing

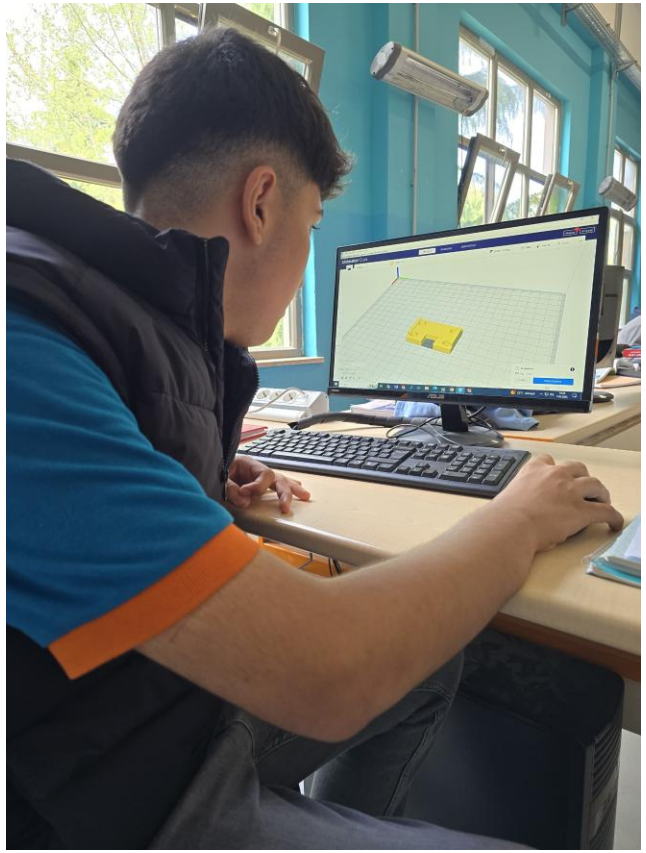
The design of the robot that is being worked on in the project is carried out together with the students using the SolidWorks program.

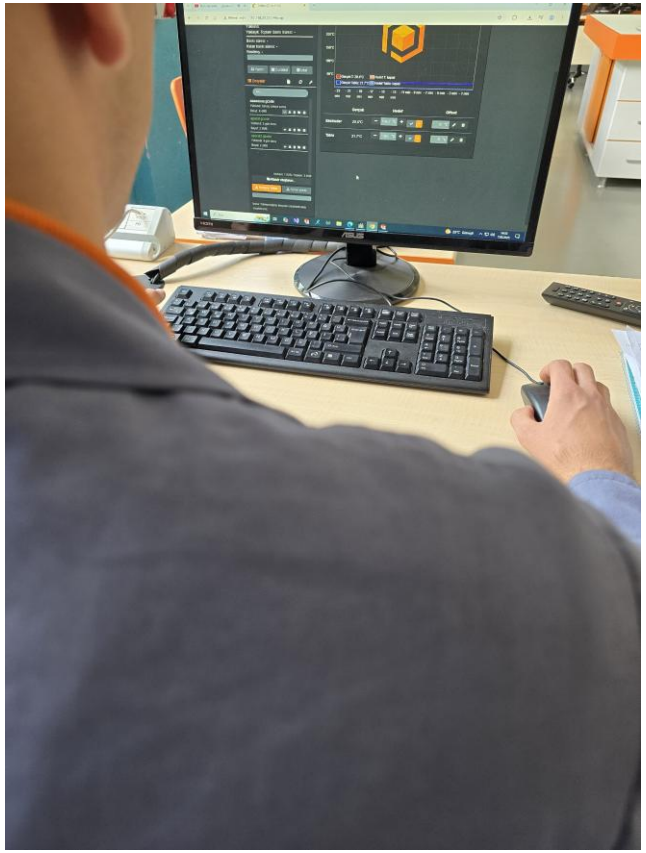



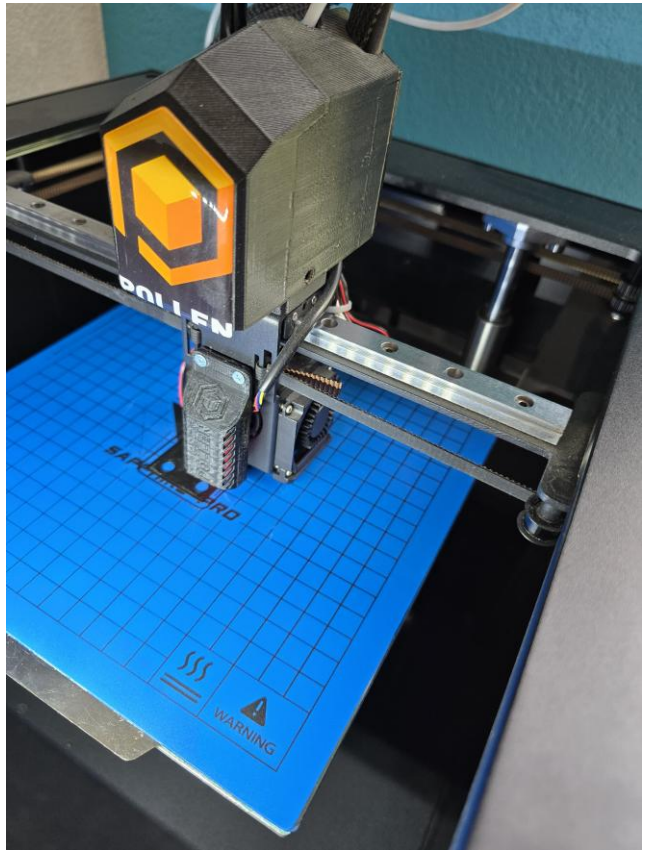


3D Printing

With the active participation of students, the printing and preparation of robot parts designed using a 3D Printer are carried out.

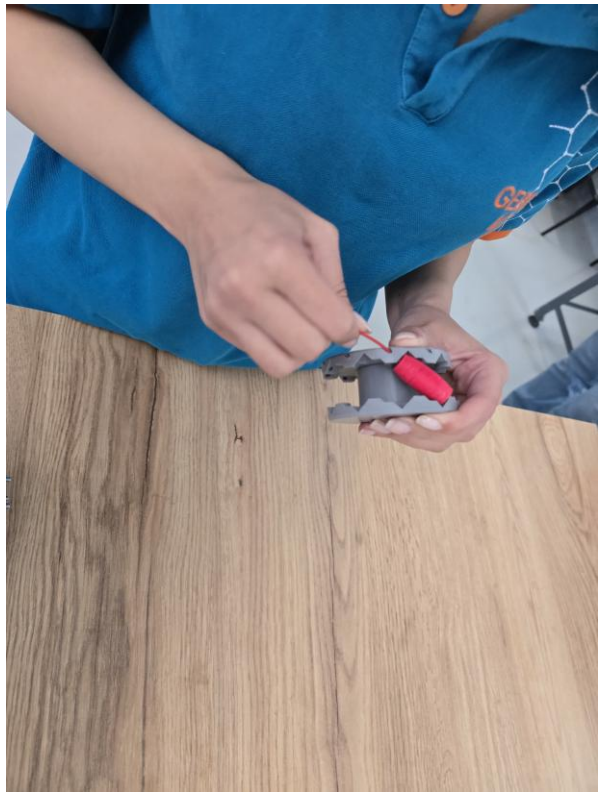


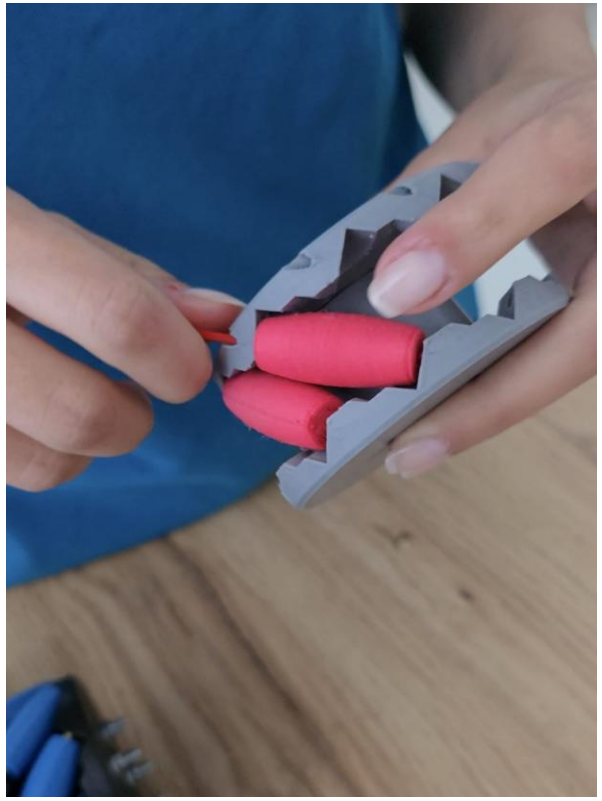




Manual Assembly

On the Manual Assembly Table, assembly operations of previously printed or supplied robot parts are carried out.







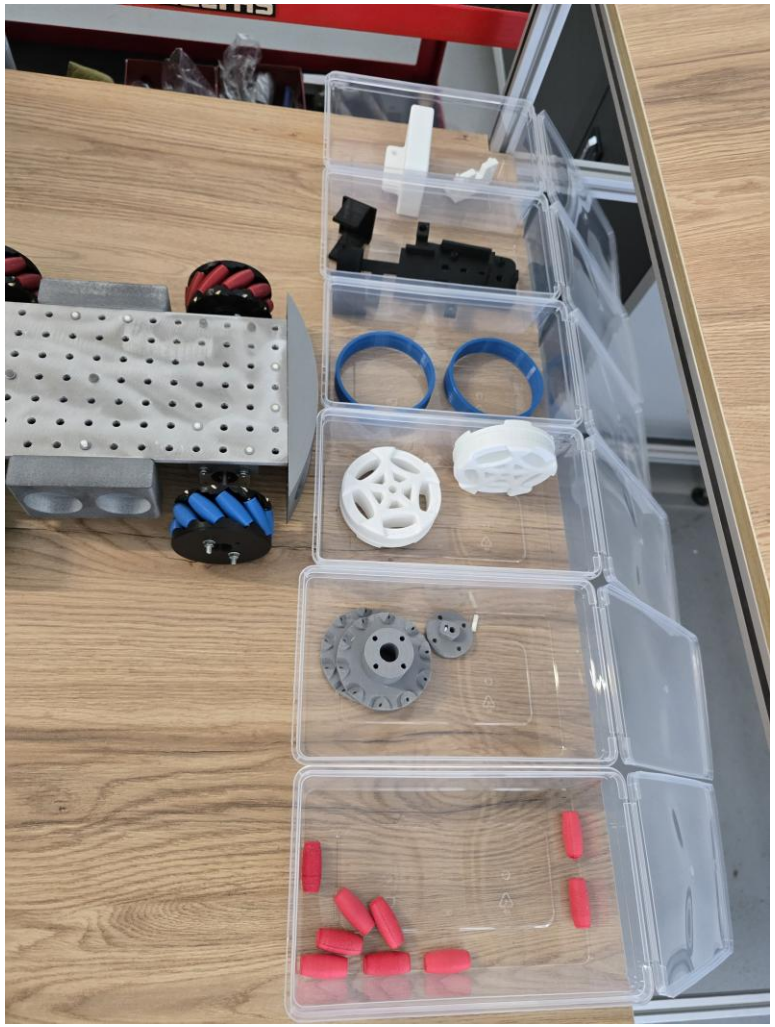


Manual Assembly

GEBKİM EĞİTİM, ARAŞTIRMA ve SAĞLIK VAKFI 2017

LCAMP Learner Centric Advanced Manufacturing Platform







Courses For CLF

Three courses have been designed to provide training within the scope of CLF within our institute. These are;

- 1-) 3D Designing Training
- 2-) 3D Printing Training
- 3-) Manual Assembly Techniques

Courses For CLF

3D Designing Training

- This 3D Designing with SolidWorks course provides a comprehensive introduction to computer-aided design (CAD) using SolidWorks, one of the industry's leading 3D modeling software.
- The course covers fundamental and advanced SolidWorks features, including sketching, part modeling, assemblies, and technical drawings, as well as parametric design principles. Participants will learn how to create highly detailed 3D models, apply materials, perform simulations, and prepare designs for 3D printing or manufacturing.
- By the end of the course, students will be able to develop professional CAD models, optimize designs for engineering applications, and produce detailed technical documentation for manufacturing processes.

Courses For CLF
3D Designing Training

- This course provides a practical and theoretical foundation in 3D printing (additive manufacturing), covering the entire process from design to post-production. Students will gain hands-on experience with 3D modeling, slicing software, printer operation, troubleshooting, and material selection.
- The course explores different printing technologies (FDM, SLA, SLS), real-world applications in engineering, healthcare, and product design, and advanced techniques such as multi-material printing and 3D scanning.
- By the end of the course, students will be able to design, optimize, and print functional 3D models and understand how to apply 3D printing in professional environments.

Courses For CLF

Manual Assembly Techniques

- This course focuses on the fundamental skills required for manual assembly in industrial and manufacturing environments. It covers essential techniques, tools, and best practices for assembling mechanical and electronic components by hand.
- Through hands-on activities and theoretical lessons, students will learn how to assemble complex systems with precision, ensuring both quality and safety standards are met.
- The course is designed for students and professionals seeking to enhance their technical skills in manual assembly, commonly applied in sectors such as automotive, electronics, and machinery manufacturing.

THANK YOU.



LCAMP CLF Concept By DHBW Heidenheim

Prof. Dr.-Ing. Klaus-Dieter Rupp
Dipl.-Ing. Ralf Steck
Jan Stenzel, M.Ed.

2025-05-12

LCAMP CLF concept by DHBW

Learner Centric Advanced Manufacturing Platform

We would like to invite you to join our CLF journey @ DHBW in Germany

What is our target group and educational scope?

- **EQF 6-7 HVET**
  - **Bachelor of Engineering**
    - There are 24 degree programs in the following faculties:
      - ✓ Faculty of Health Studies
      - ✓ Faculty of Social Work
      - ✓ Faculty of Technology
      - ✓ Faculty of Economics

- ***NEW*** **Master of Science Program** "*located@Heidenheim*"





Image source : Derived from DHBW HDH Homepage

What means collaboration for us?

LCAMP
Learner Centric Advanced Manufacturing Platform

- Students / Learners Use Advanced Manufacturing Technologies
- Transcultural Teams
- Collaborative Problem Solving
- Multilingual Communication
- Become Acquainted With International Working Culture



Image source : Derived from DHBW HDH Homepage

What defines our CLF at DHBW Heidenheim?

LCAMP
Learner Centric Advanced Manufacturing Platform

Advanced Manufacturing Technologies

- 3D Printer
- 3D Scanner
- Cutting Technologies (Laser/ Water Jet)
- CNC Milling
- AR-Assembly
- Collaborative Robot
- Bosch MPS (Sensor Assembly)

Advanced Process Technologies

- Product Configuration
- MES, Node-Red
- Digital Twin (URDF, MQTT, OPC/UA)
- Solid Works / Siemens NX
- LMS Moodle
- ROS (Robot Operating System)



Image source : Derived from DHBW HDH Homepage

Didactical Premisses

- Human- / Lerner-Centric, CBE (Competency Based Education)
- Open For Internationalization
- Flexible/ Scalable (Open Curriculum)
- Lifelong Learning
- Multifaceted Learning-Environments
  - *Blended Learning*
  - *Experiential Learning*
  - *Collaborative Learning*
  - *Open Learning*

eady For EDC (European Digital
edential) Infrastructure

How the DIDACTICAL principles define our approach?

The didactical setting & line-up of the manufacturing technologies utilized along the CLF shall equip the learner with targeted skills to address and solve (future) real-world problems of the manufacturing sector such as:

- **Customer Orientation** → Customer Focus, Adaptability, Process Orientation
- **Product Configuration** → Knowledge graph-based connection-driven product configuration
- **MES Process Configuration** → MES Logical Sequence: Input/Output/Systems by FORCAM
- **Human-Centred Learning Environment** → Blended Learning, Experiential Learning, Collaborative Learning
- **Assembly with AR assistance** → Using ARKITE as our common international part of the LCAMP CLF
- **Structure of LCAMP Logistics** → Reflecting Industrial SCM
- **Micro-Credentials linked to the CLF** → According to European Standards
- **Circular Economy / Supported Processes** → LCAMP integrates circular economy principles directly into the development of learners' skills.

Customer Orientation

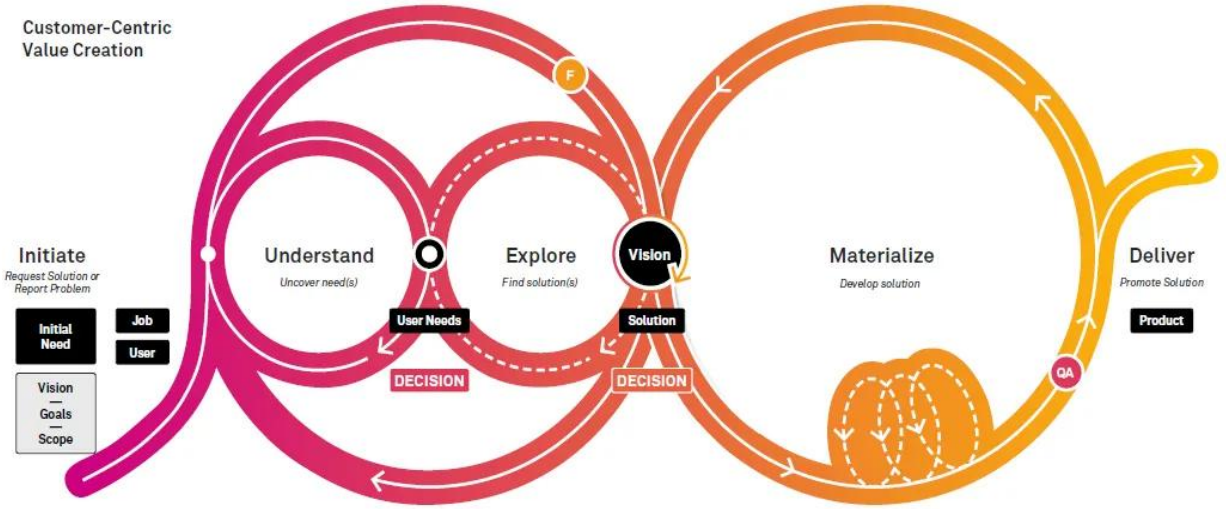


Image source : Derived from https://juanfernandopacheco.com/2025/04/customer-centric-value-creation/

- **Customer Focus:** All stakeholders along the process chain are regarded as customers to create value together.
- **Adaptability:** Adaptability drives innovation throughout the entire product life cycle.
- **Process-Oriented Systems:** Configurable, process-oriented systems promote circular value within the circular economy.
- **Customer Journey & Quality:** Quality arises from meeting real customer needs – essential for fulfilling expectations.
- **Customer Experience Enhancement:** Data-driven optimization of the customer experience increases satisfaction, loyalty and competitive advantage.

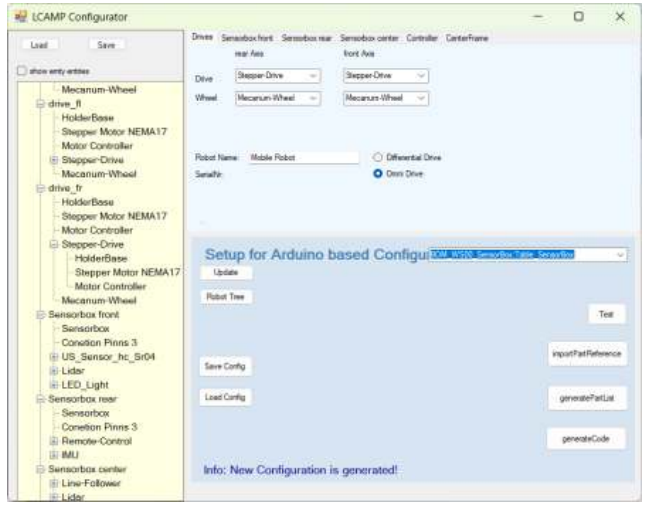
Product Configuration

Learner Centric Advanced Manufacturing Platform

Configuration
LCAMP Robot

Knowledge graph-based connection-driven product configuration

A contextual and circular product configurator structures multi-variant products using a complex bill of materials system based on a multi-dimensional knowledge graph. Individual parts and assemblies are modelled as exclusive 'item variants', enabling durable and maintainable product design through modular, sustainable materials. The configurator links product structure, assembly planning, digital twins and learning content via platforms such as Moodle and Simumatik. It simultaneously supports industrial production and collaborative learning factories through the end-to-end integration of PDM, MES and AR systems. The configuration is didactically supported by simultaneous engineering, feedback loops and standardized learning modules.



Source : Prof.-Dr. K.-D. Rupp / Configuration Manager for a Collaborative Learning Factory, CLF2025

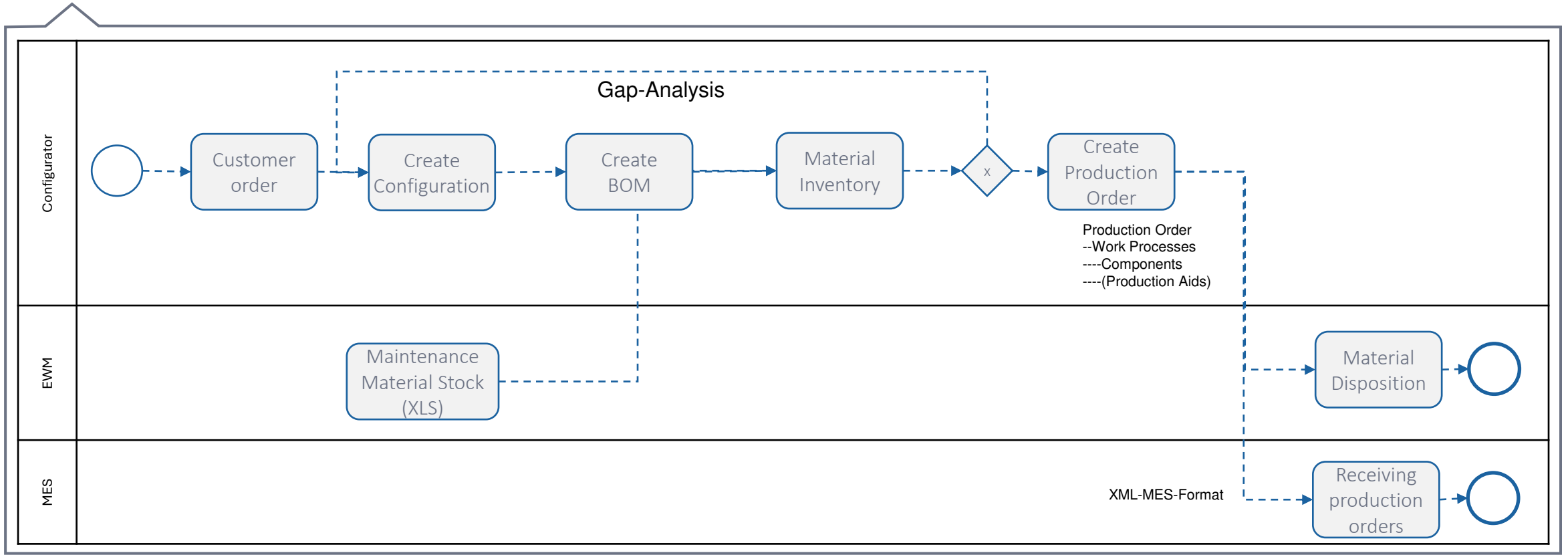
DHBW – MES Process Configuration

Learner Centric Advanced Manufacturing Platform

Configuration LCAMP Robot

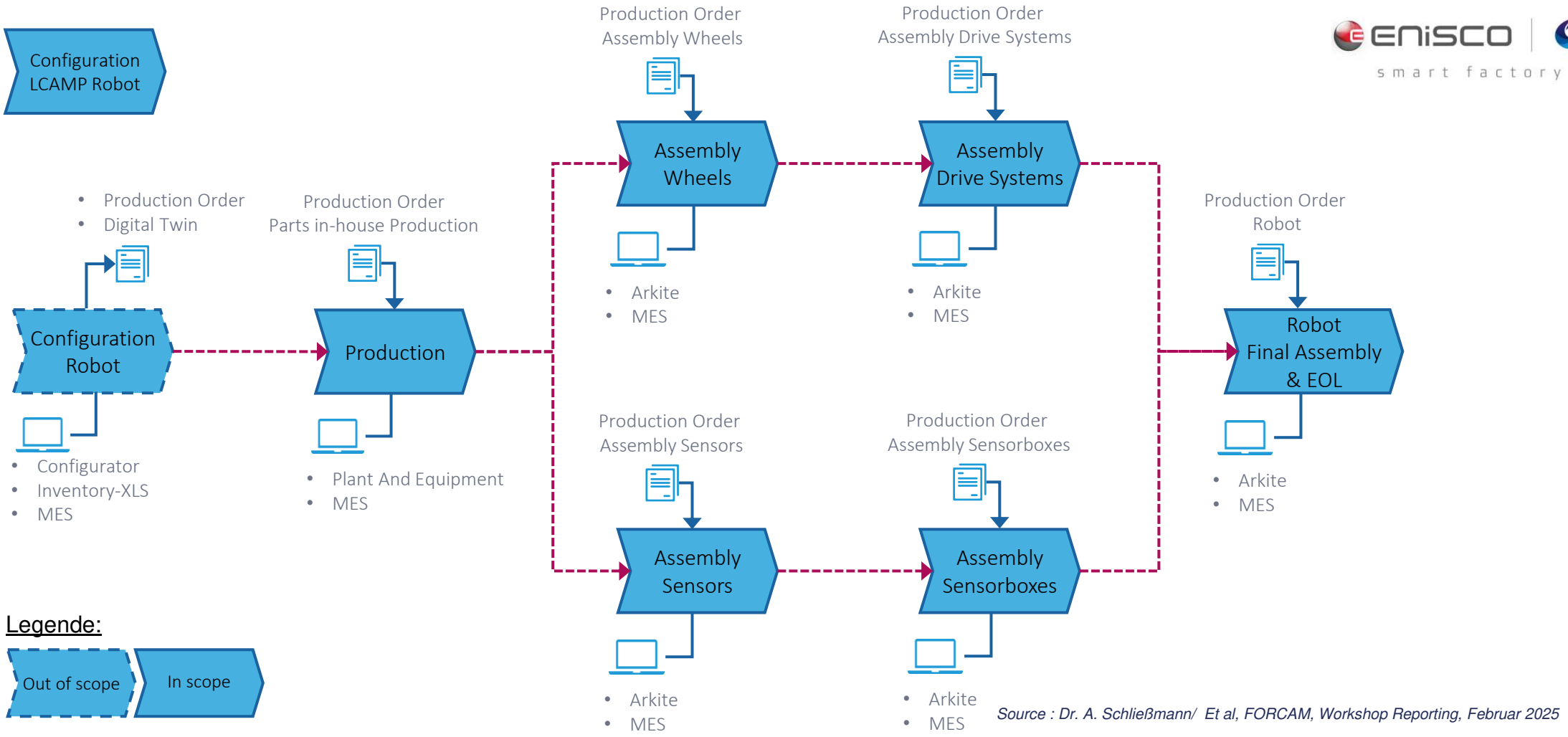
"Learning about production-related configurations enables cognitive activation that corresponds to real industrial requirements" (Abele et al., 2017).

enisco | FORCAM
smart factory experts



Source : Dr. A. Schließmann/ Et al, FORCAM, Workshop Reporting, Februar 2025

DHBW – MES Logical Sequence: Input/Output/Systems



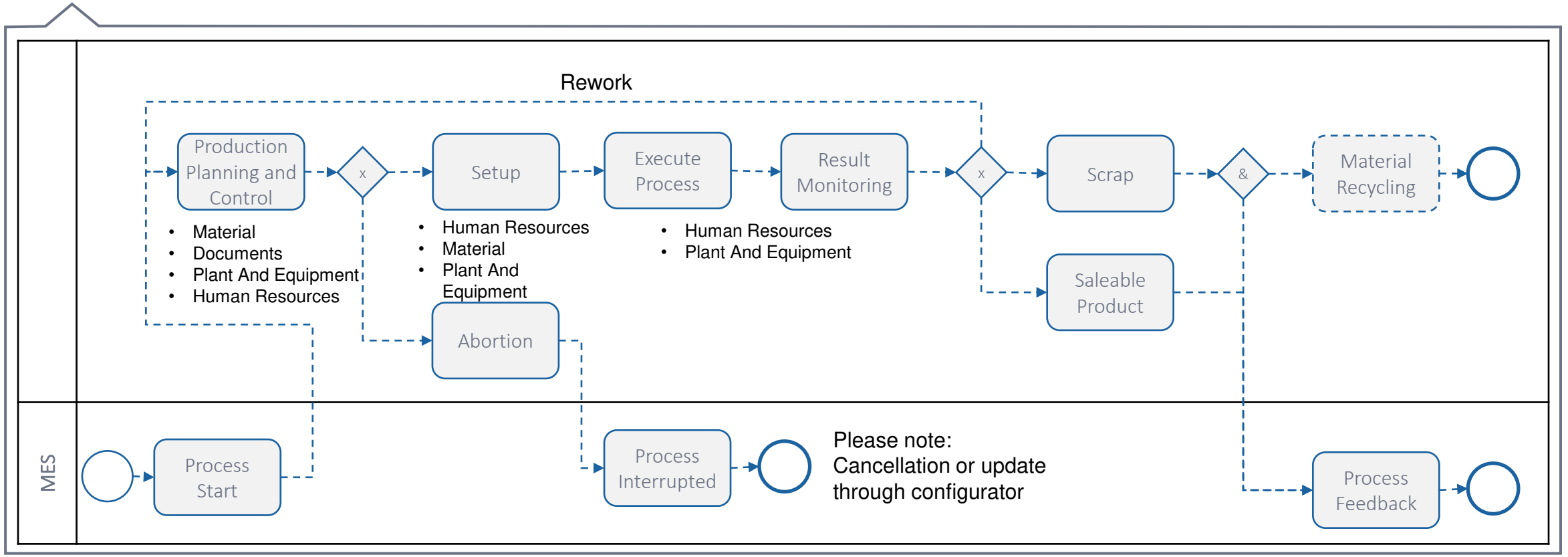
Source : Dr. A. Schließmann/ Et al, FORCAM, Workshop Reporting, Februar 2025

DHBW MES - Draft Process module – „Common Work Process“

Learner Centric Advanced Manufacturing Platform

General

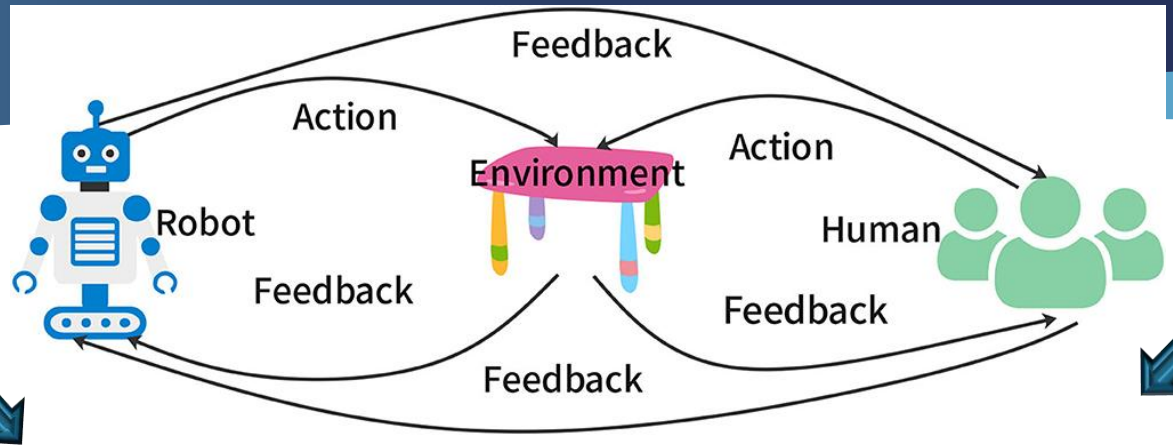
enisco | FORCAM
smart factory experts



Source : Dr. A. Schließmann/ Et al, FORCAM, Workshop Reporting, Februar 2025

Human-Centred Learning Environment

LCAMP
Learner Centric Advanced Manufacturing Platform



Challenge

Collaboration

Engagement

Assessment

Relevance

Gamification

Supervision

Personalization

Reflection



Assembly with AR assistance based on the selected configuration

Configurator output format description:

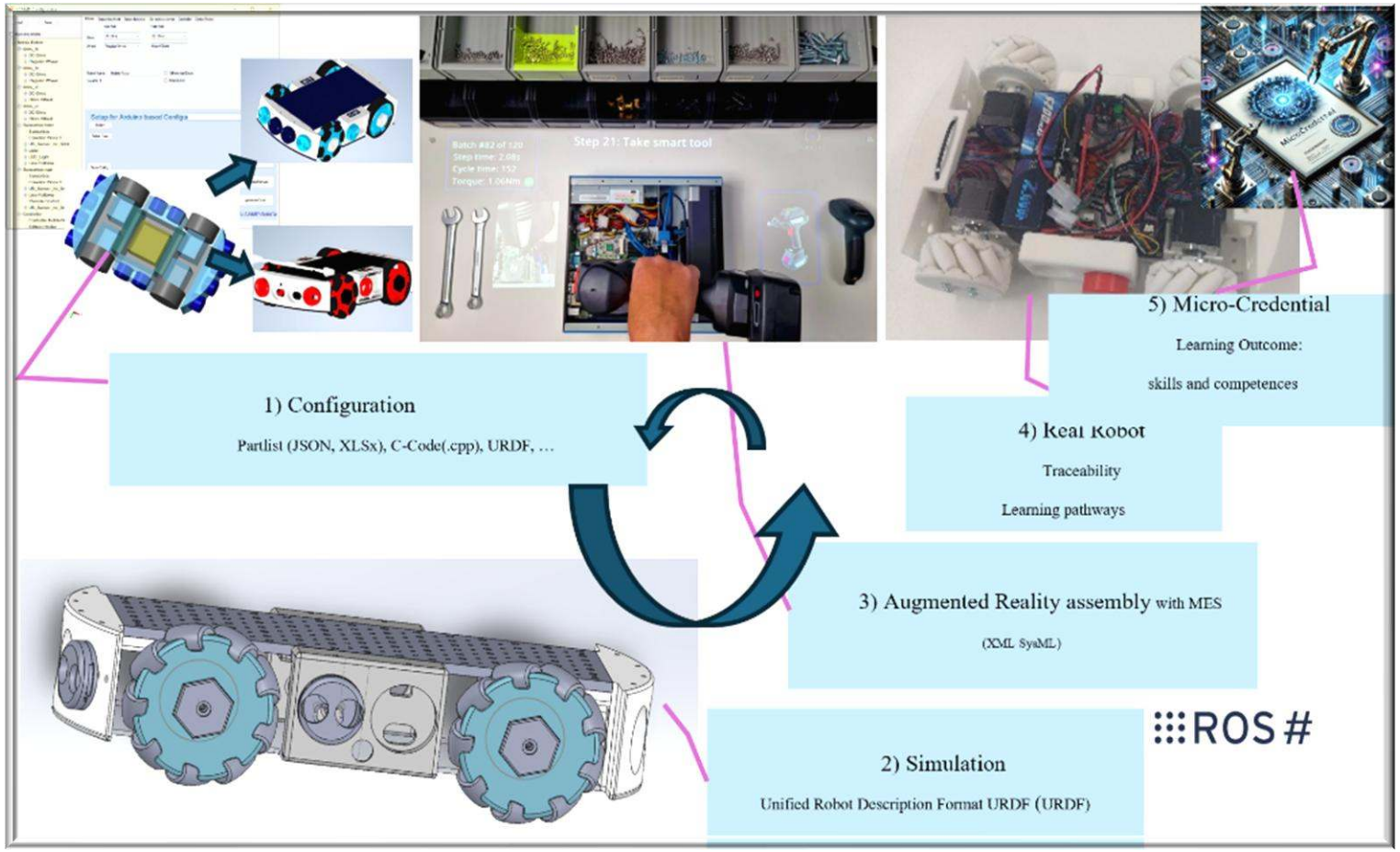
1) Robot Description
   - *.JSON
   - *.XLSX
   - *.CPP

2) Simulation
   - *.URDF
   - *.SLX

3) Assembly With MES
   - *.XML, (SYS ML)

4) Real Robot
   - *.PDF

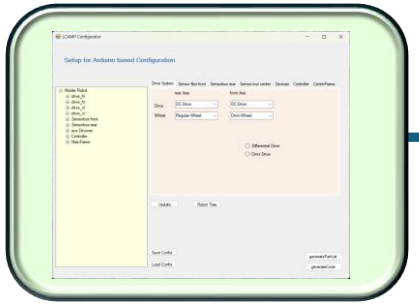
5) Micro-Credentials
   - *.PDF-XML (*Europass*)

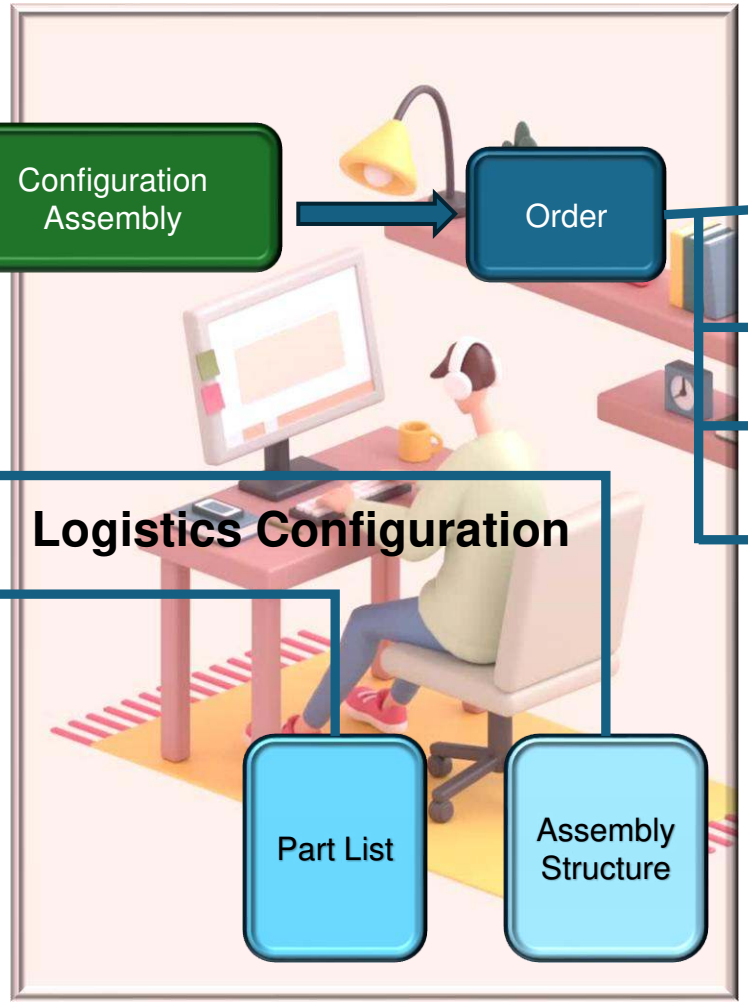


Source : Prof.-Dr. Rupp/ DHBW HDH, own photographs / designs and graphics, 2025
Source: Jonas Duller/ DHBW HDH, student research project „Branding LCAMP Roboter“, Januar 2025
Source: Derieved from ARKITE Homepage, 2025

Structure of LCAMP Logistics







Configuration Assembly

Order

Procurement

Shipping

Assembly

Production

Logistics Configuration

Defined Part

Warehouse Structure

Part List

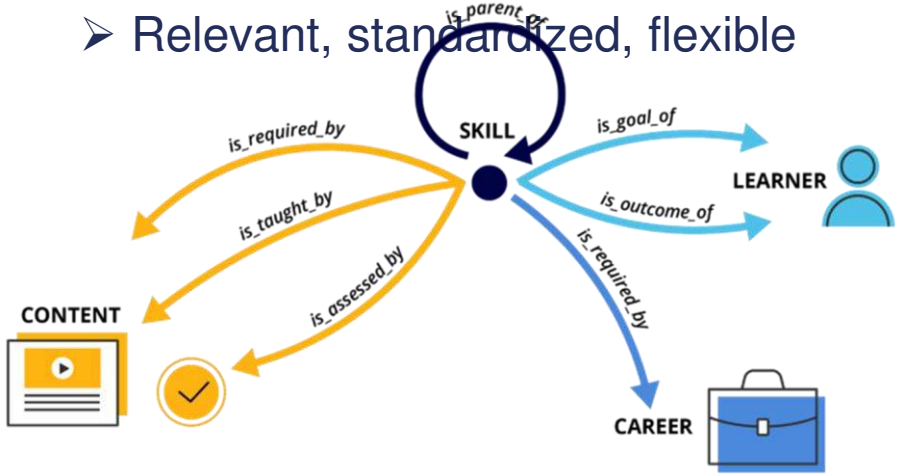
Assembly Structure

Source : Prof.-Dr. Rupp/ DHBW HDH, own photographs / designs and graphics, 2025

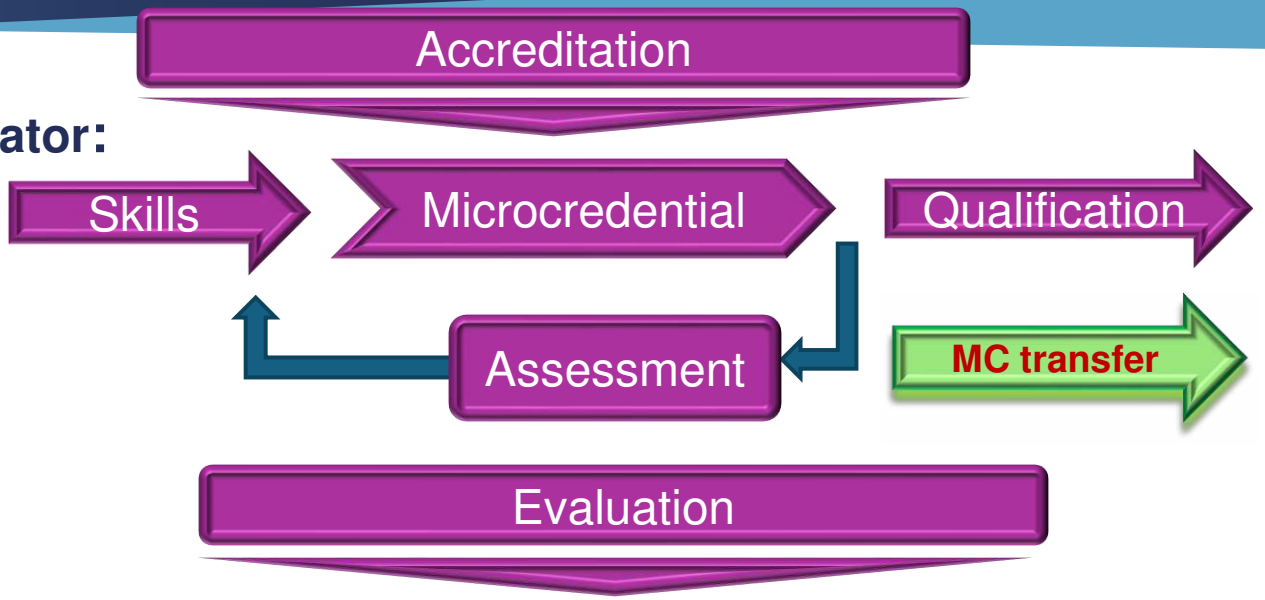
Micro-Credentials linked to the CLF

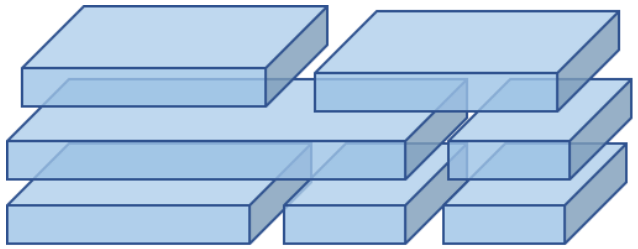
This is managed in collaboration with the Configurator:

- Embedded in the accreditation system
- MC belongs to the student
- Can be integrated into a program
- Can be credited only once
- Relevant, standardized, flexible



Source : The original source of this graphic has not been clearly identified despite extensive research (including Google Reverse Image Search).





MC

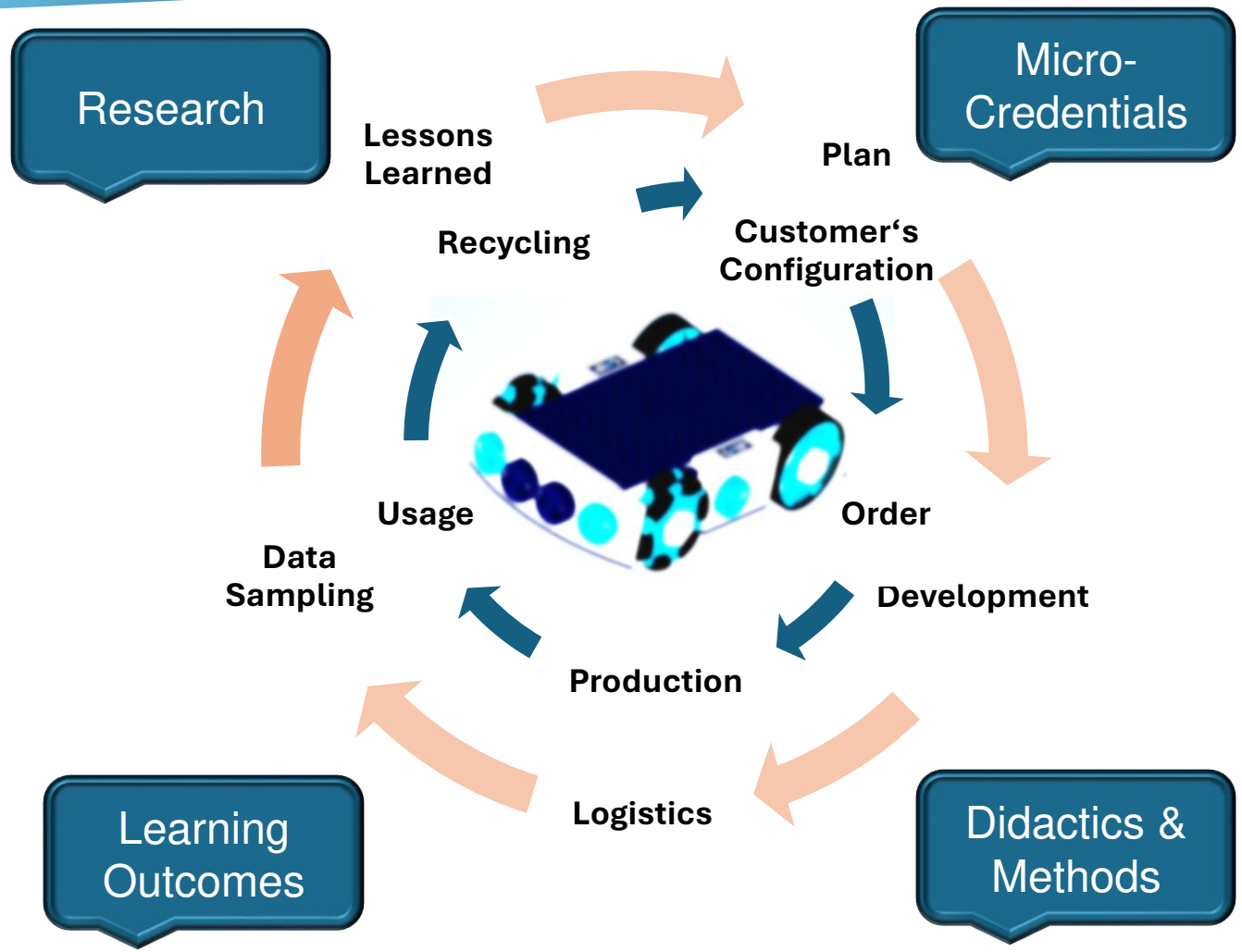
Stack 5..30ECT

Bundel 5..6 ECTS

Source : Prof.-Dr. Rupp/ DHBW HDH, own photographs / designs and graphics, 2025

Microcredentials allow for the formally reliable documentation of small-scale competences. In the context of the European education agenda, they are seen as flexible, modular qualification building blocks. (European Commission, 2020).

Circular Econonomy / Supported Processes



Configuration	
Order related to learning context	Generation of ressources

Production: Product Assembly		
Part production		Logistics, shipping

Use of Product	
Product Test	Product development

Recycling: Product Disassembly	
Disassembly	Inverse Logistics

Education for sustainable development is increasingly being called for as an integral part of technical education (UNESCO 2022). LCAMP integrates circular economy principles directly into the development of learners' skills.

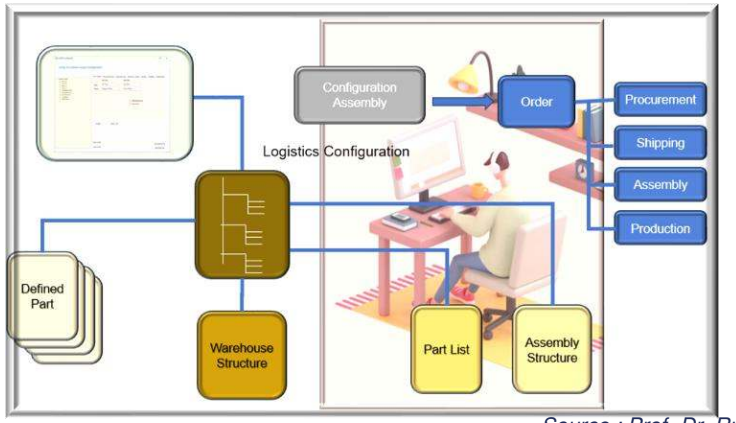
Source : Prof.-Dr. Rupp/ DHBW HDH, own photographs / designs and graphics, 2025

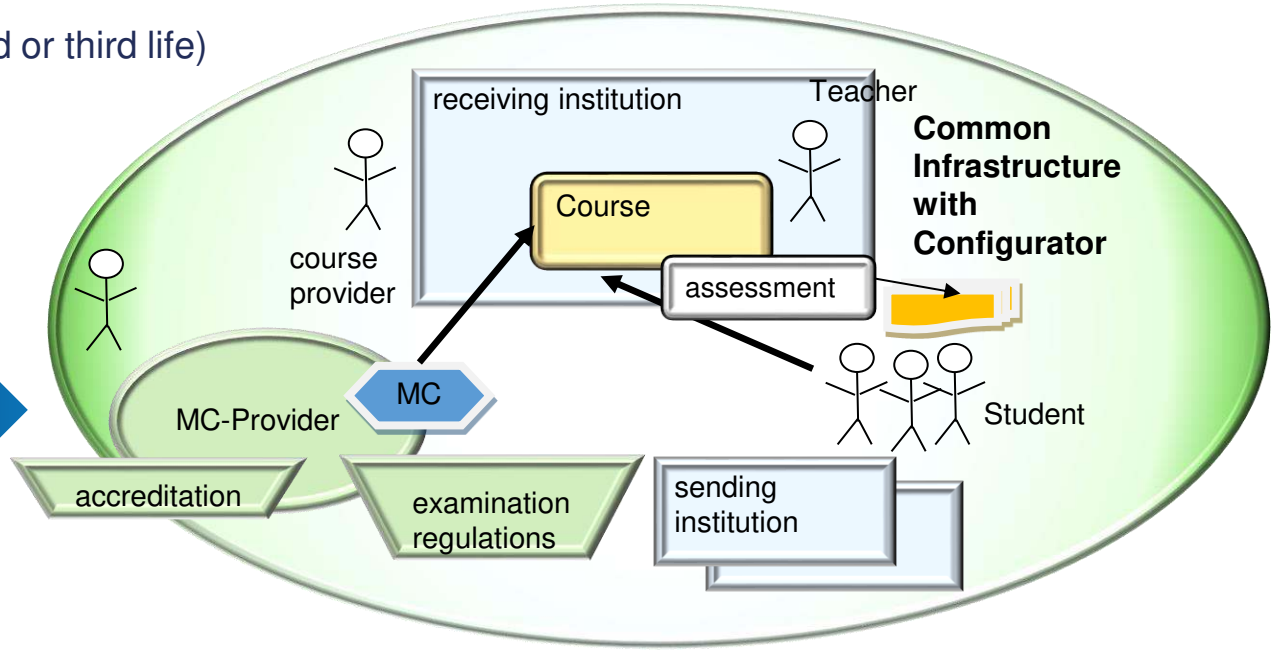
Conclusion

The Configuration Manager is an essential building block in the Collaborative Learning Factory. It connects product structures with production. Learning content and processes are linked on the LCAMP platform. As it is open-source software, it can be adapted to the requirements of different products and learning factory environments. The open-source Configuration Manager, along with its associated processes, can become the foundation for Learning Factories with high production variance and the circular economy aspect

The next steps are:

- Extend connectivity to other tool chains such as 3D-Experience, FORCAM MES, Matlab, Simscape, Simumatik, ARKITE
- Extension for full traceability in the circular economy (second or third life)
- Integration of AI tools on the LCAMP innovation alliance
- Integration of a Brand Manager (under development)





Source : Prof.-Dr. Rupp/ DHBW HDH, own photographs / designs and graphics, 2025

Collaborative Learning Factories For Digital Production: The Cooperative Manufacturing In Industry 4.0

Learner Centric Advanced Manufacturing Platform



Source : LCAMP 2023

This is why we are promoting CLFs in LCAMP.

Thank you very much for joining our CLF journey @ DHBW in Germany



Source : ChatGPT4.0 / own graphic / prompted by Ralf Steck / April 2025

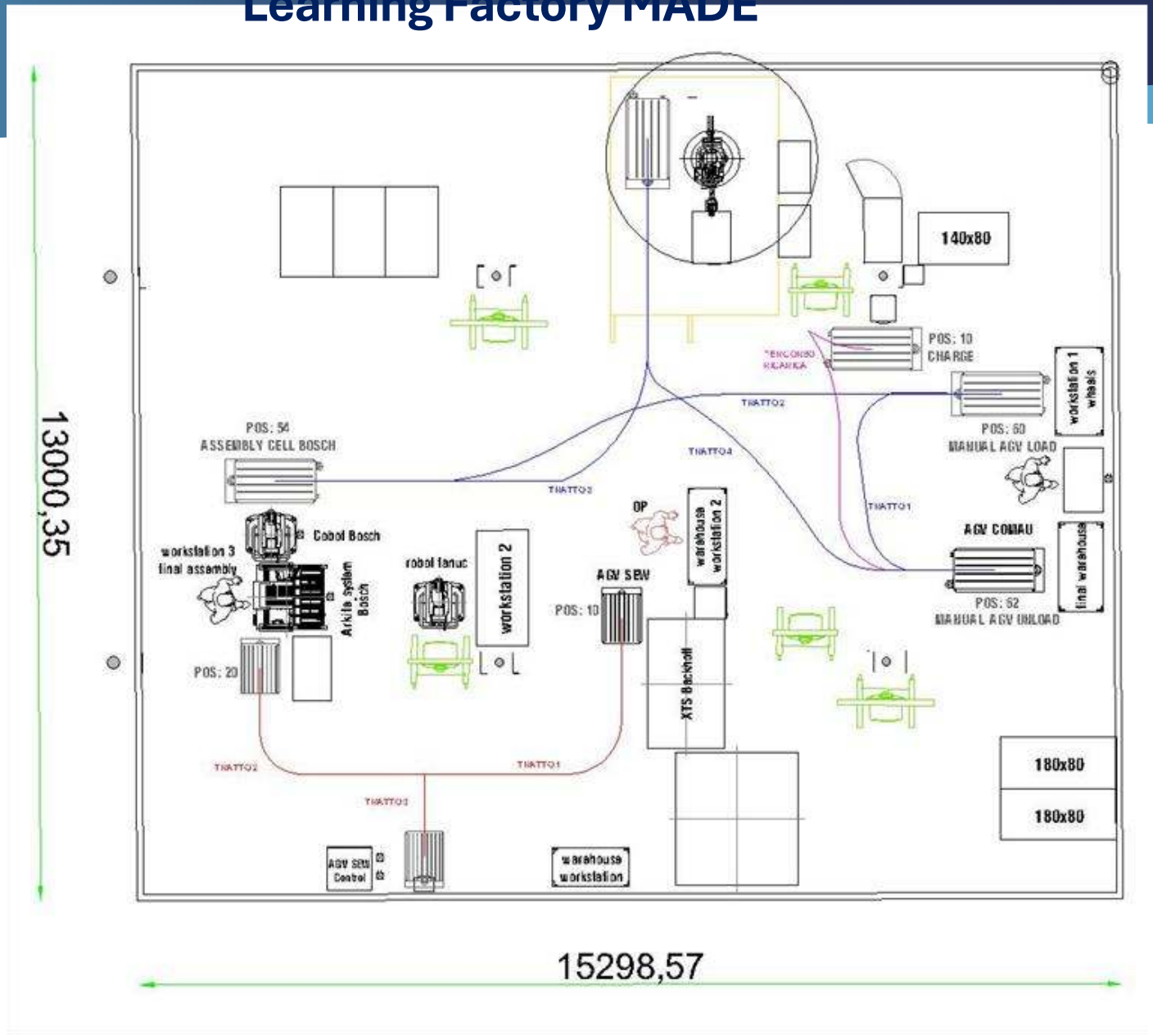
LCAMP
Learner Centric Advanced Manufacturing Platform

Collaborative Learning Factory by MADE

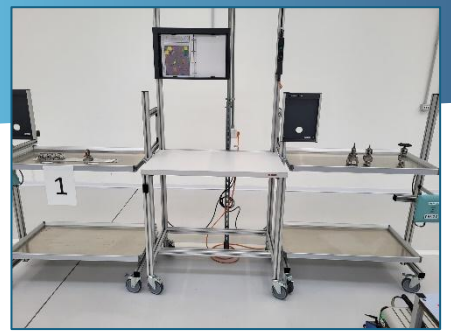
Matteo Barbarossa

2025-05-12

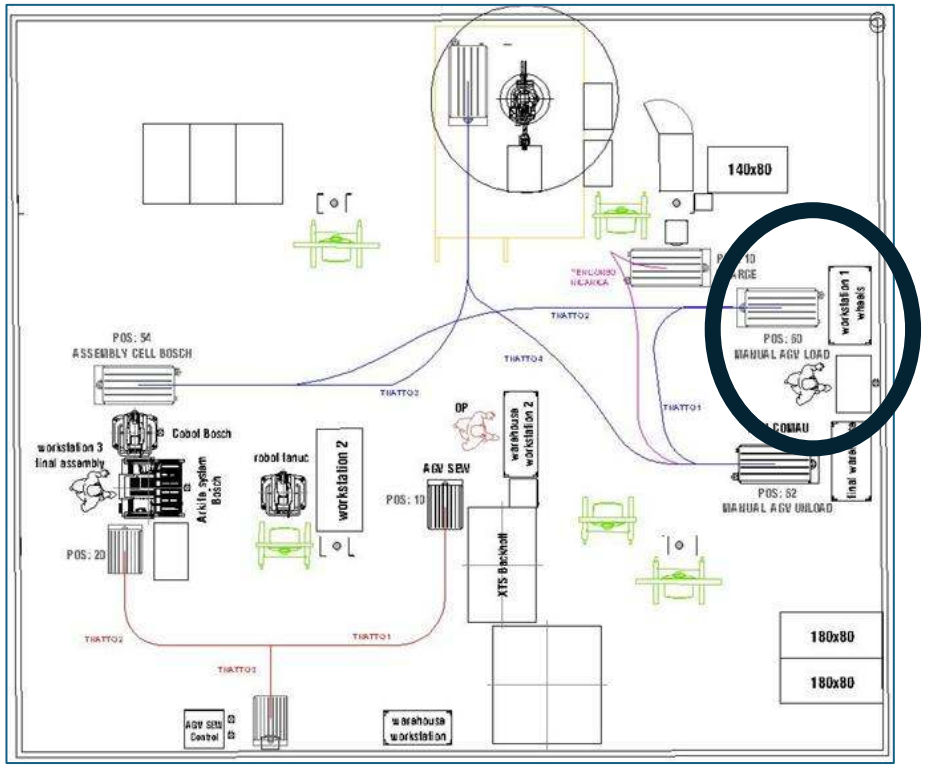
Learning Factory MADE



Learning Factory MADE







WORKSTATION 1 – Wheels Assembly

At this station, the operator assembles the wheels required for the robot. There are three different types of wheels used:

- **Standard wheels**
- **Mecanum wheels**
- **Omni wheels**

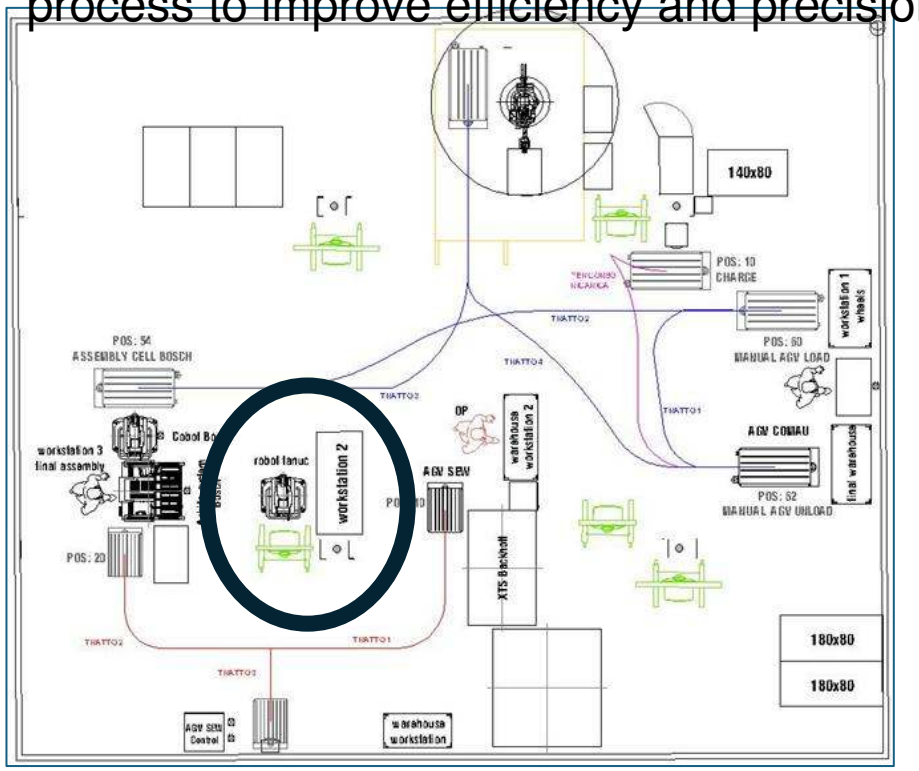
Throughout the assembly process, the operator is guided and supported by **augmented reality through Microsoft HoloLens**. This system provides step-by-step visual instructions, overlays, and real-time assistance, ensuring accurate and efficient assembly of each wheel type.

Learning Factory MADE

Learner Centric Advanced Manufacturing Platform

WORKSTATION 2 – Chassis Assembly

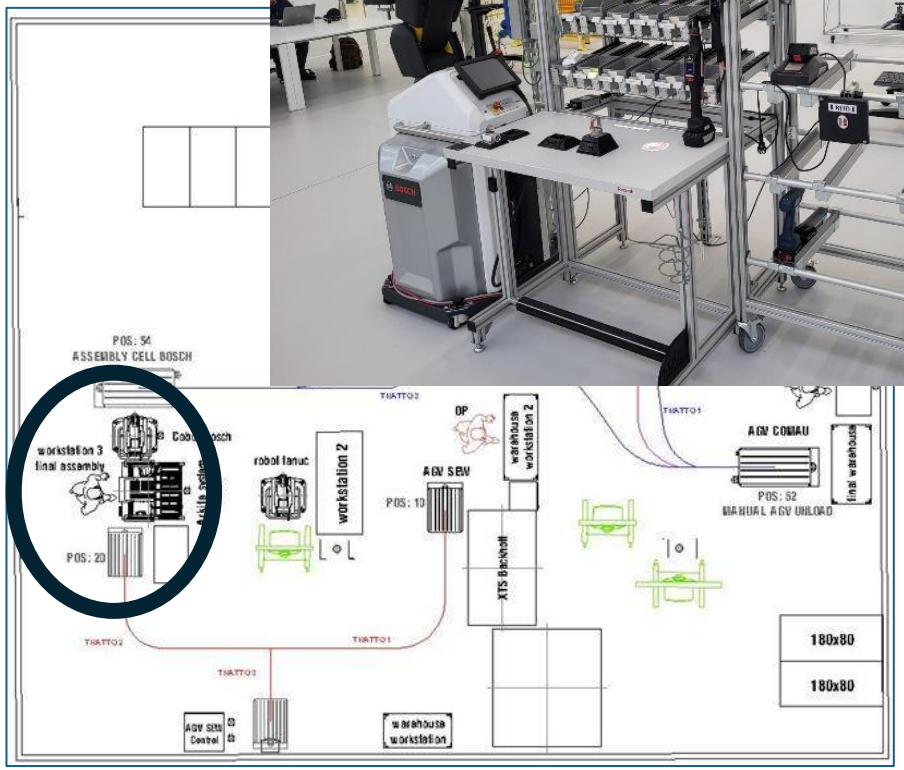
At this station, the operator assembles all structural components of the chassis as well as some . The operator is assisted by a **Fanuc CRX-10 collaborative robot**, which supports and facilitates the assembly process to improve efficiency and precision.





Learning Factory MADE





WORKSTATION 3 – Electronics and Final Assembly

Station 3: Electronics and Final Assembly
In this station, the operator installs all electronic components inside the chassis assembled in Station 2. The operator also completes the final assembly by mounting the wheels prepared in Station 1.
The entire process is supported by **Arkite's assisted assembly system**, which provides real-time guidance and ensures accuracy throughout the operation.

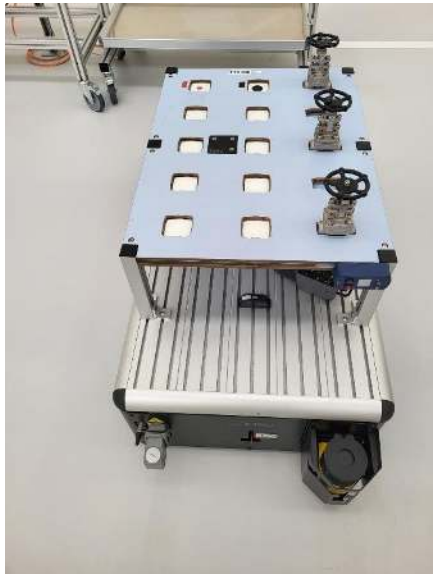
Learning Factory MADE

LCAMP
Learner Centric Advanced Manufacturing Platform

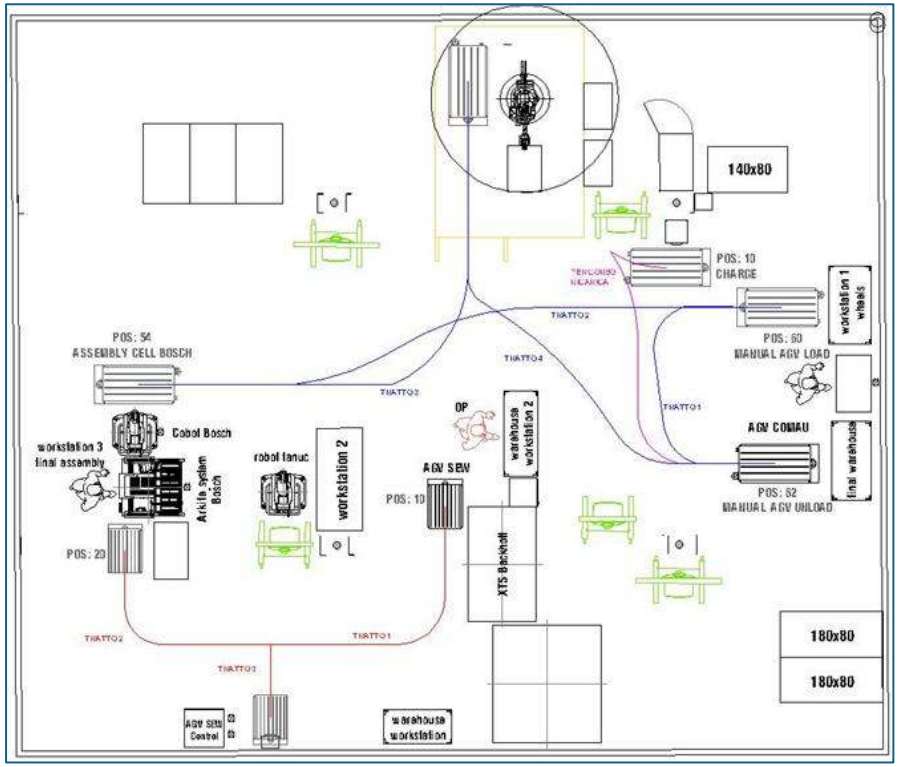
Logistics

Logistics between the stations are managed by **two AGVs (Automated Guided Vehicles)**, which transport components from Station 1 and Station 2 to the final station.
In addition, each station is equipped with a **dedicated storage area** where operators can pick up the necessary components for their tasks.









Tolosaldea
Lanbide Heziketa Institutua

Collaborative Learning Factory

Jon Busto

European project officer



www.tolosaldealh.eus

Tolosaldea
Lanbide Heziketa Institutua

WHO WE ARE

Tolosaldea LHII is a VET center located in an industrial area of the Basque Country, where most of the enterprises belong to the manufacturing sector and almost all of them are SMEs.



PROJECT'S PRINCIPLES

The CLF project is conceived with a medium- and long-term vision, but from its inception and design, the following principles have been identified:



Learning process

The **student's learning process shapes the project**, not the other way around



Constant evolution

It is a living project in **constant evolution**



Starts from scratch

Each year it **starts from scratch**



Scalable

It is **scalable**



No bound

It is **not bound to the final product**

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OUR CLF

TARGET	WHO	SME-SCHOOL	WHEN	HOW
To train students in interdisciplinary industrial 4,0 applications.	Students of design, mechatronics, and automation/collaborative robotics (EQF levels 4-5).	To mutually provide feedback at both technological and educational levels, as well as to have exemplary equipment to promote technological monitoring in the region.	We are in processes design to implement it for September 2026.	Multidisciplinary challenge-based learning methodology

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LAYOUT

Our CLF is designed with an **atomized structure**, where various equipment and specialties converge into a common project and product

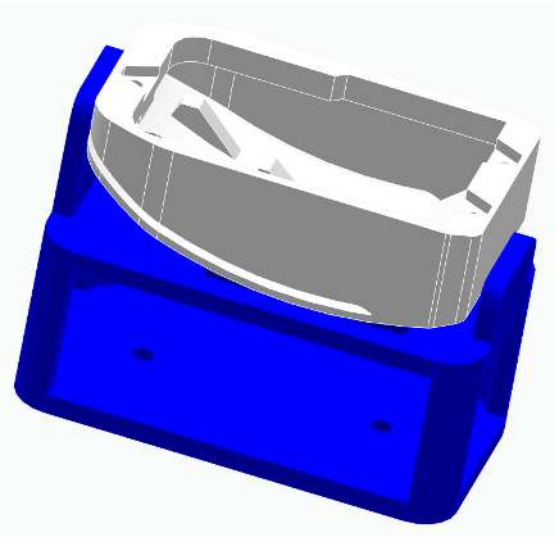
Traceability and labelling

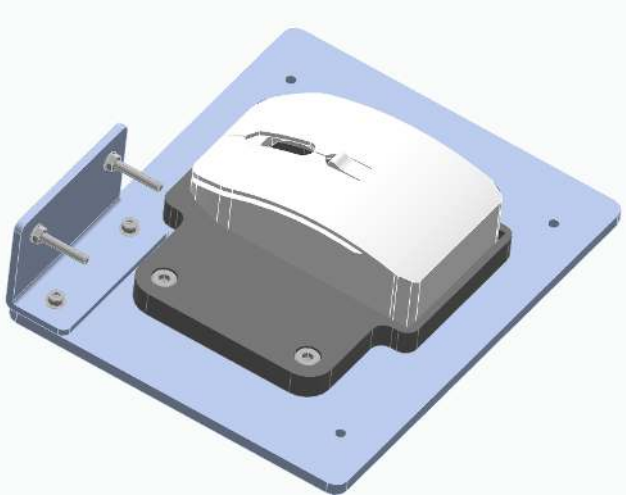
WS01 Technical department
Processes and part/tooling design

WS02 Production
Tooling/part manufacturing
Tooling/part 3D printing

WS03 MIR-Automation station
Electronica assembly

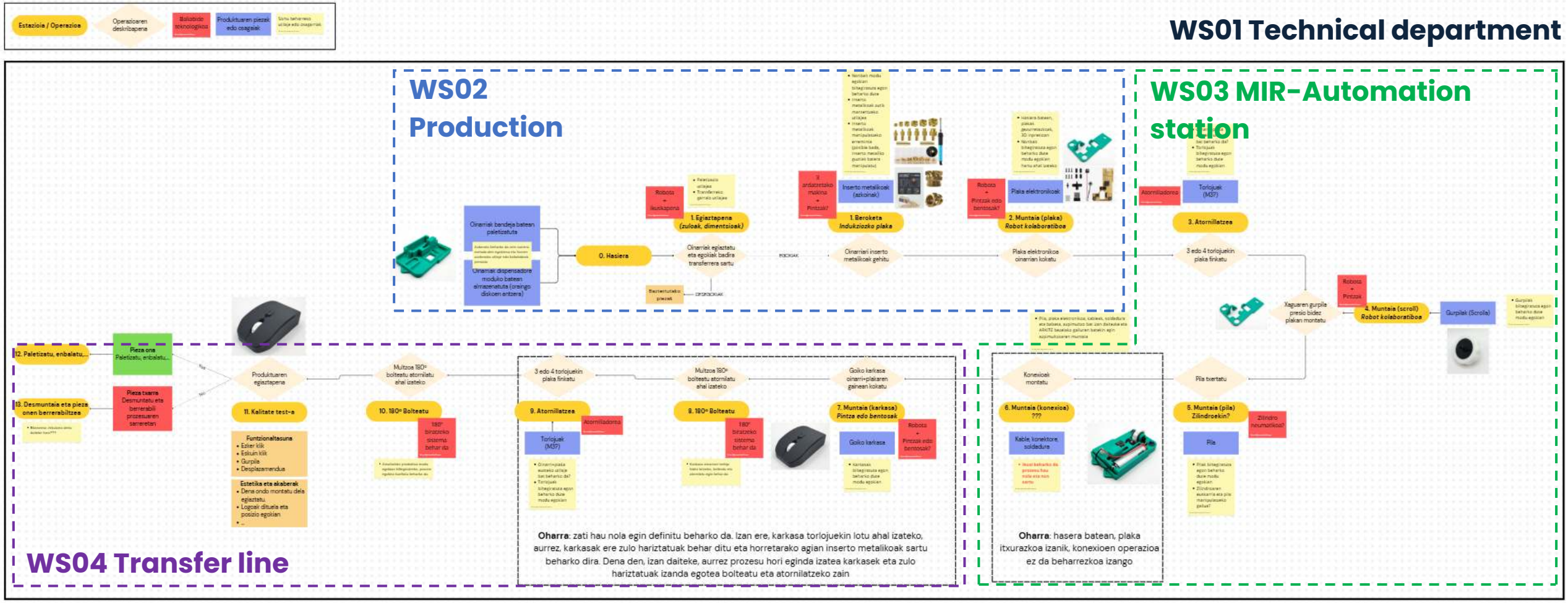
WS04 Transfer line
Final assembly and quality assurance

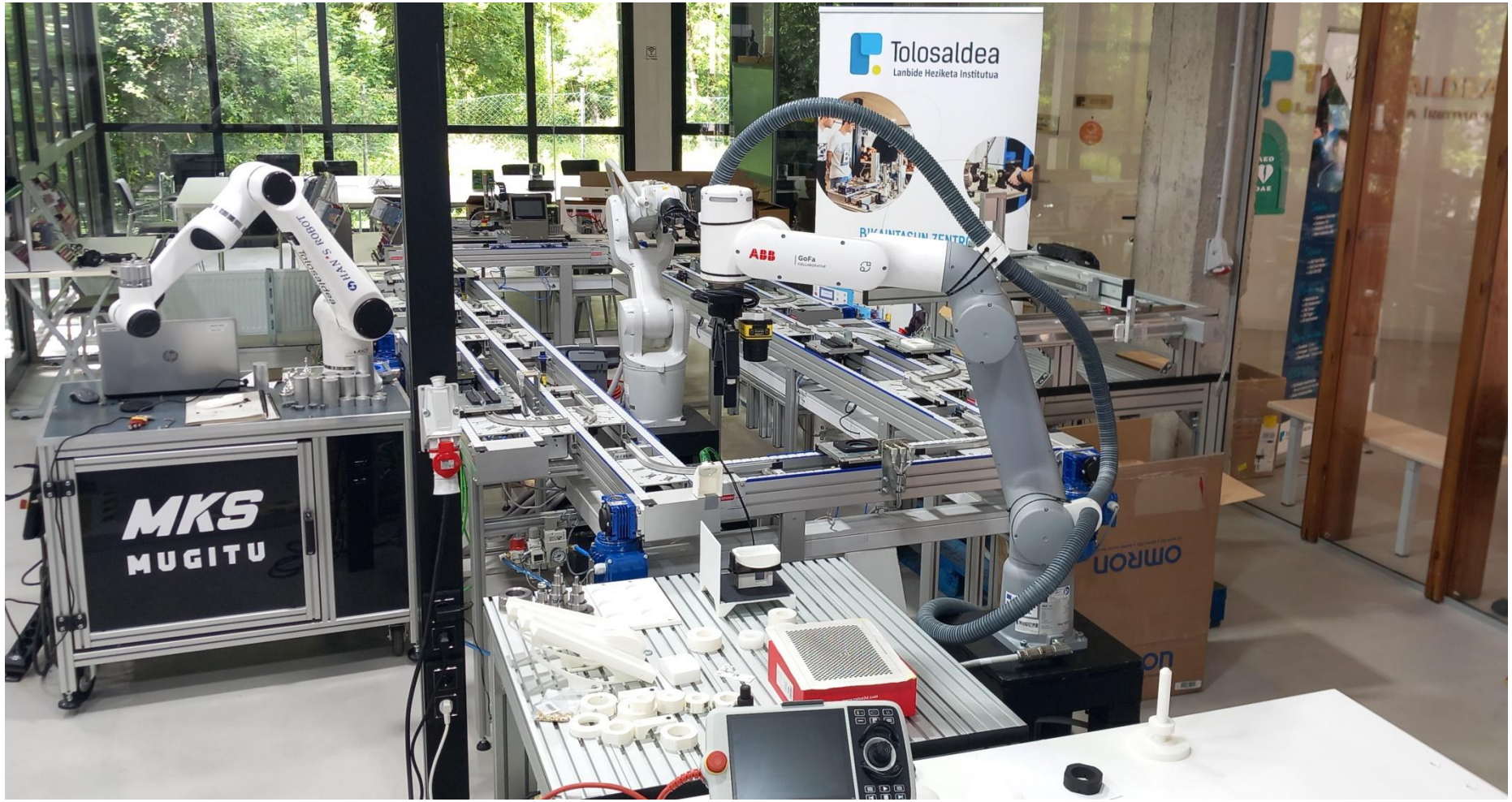




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PRODUCT PROCESS DESIGN





Our WS04 transfer line (6 workstations), where the final assembly and quality assurance take place









Thank you

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- Jon Busto

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  : (+34) 615 775 680

www.tolosaldealh.eus

CAMOSUN COLLEGE CLF OVERVIEW

Imtehaze Heerah

2025-05-13

Learner Centric Advanced Manufacturing Platform

CAMOSUN COLLEGE

CAMOSUN COLLEGE CLF OVERVIEW

IMTEHAZE HEERAH
heerah@camosun.ca

#LCAMP_EU

2025-05-13

Co-funded by
the European Union

Camosun College (CC) CLF development roadmap

LCAMP
Learner Centric Advanced Manufacturing Platform

Summer 2024 (May – Aug)

- Robot V1 Design Analysis
- Robot V1 Design Build
- Design changes informed by V1 build
- CC Robot (V2) Development

Fall 2024 (Sep – Dec)

- Testing of CC robot
- Creation of Assembly instructions
- Review of instructions

Winter 2025 (Jan – Apr)

- Development of CC CLF layout
- Start of CLF implementation
- Electrical design work
- Partial integration of CC robot in curriculum
  - **MENG 284** - Robotics & Automation

Summer 2025 (May – Aug)

- Complete electrical design
- CLF development complete
- CLF testing and refining

Fall 2025 (Sep – Dec)

- Future robot changes
- Curriculum integration
  - **MENG 141** – Manufacturing Processes I
  - **MENG 283** – Control Systems

Winter 2026 (Jan – Apr)

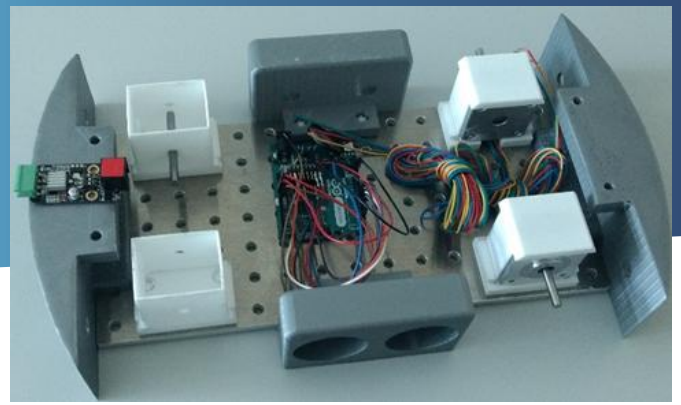
- Introduction of robotics assembly to CLF
- Curriculum integration
  - **MENG 152** – Engineering Graphics & Modeling
  - **MENG 284** – Robotics & Automation



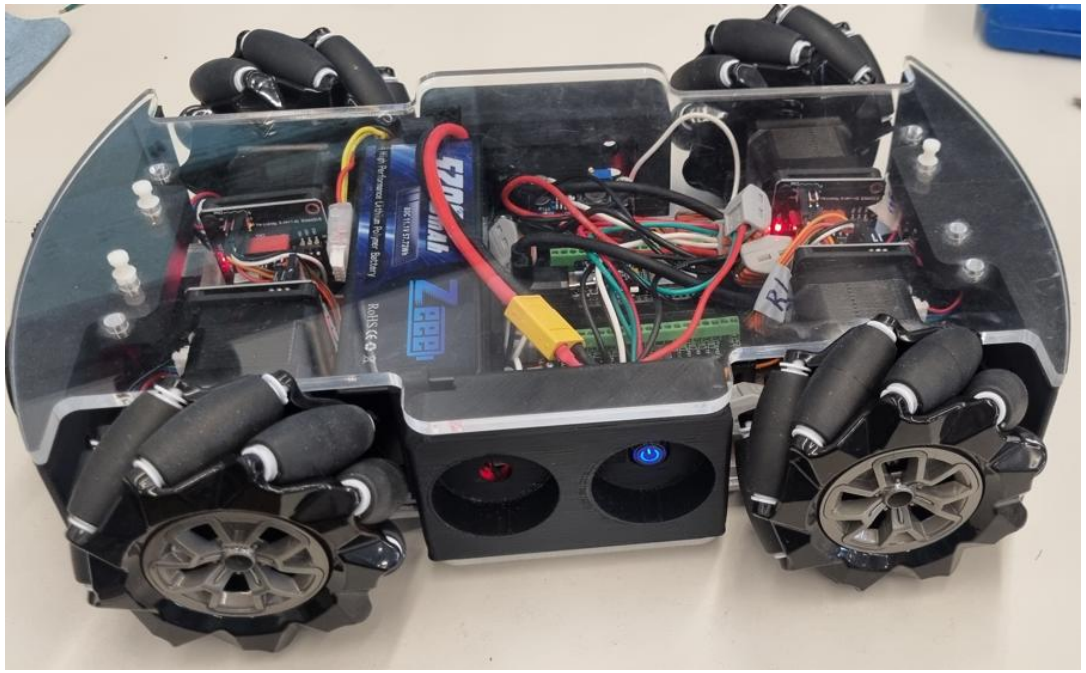
Collaboration and check-ins with LCAMP Partners

ROBOT DESIGN EVOLUTION

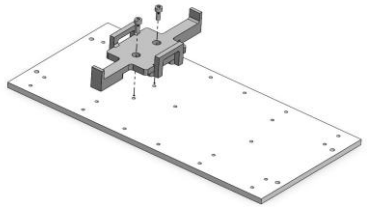
LCAMP
Learner Centric Advanced Manufacturing Platform

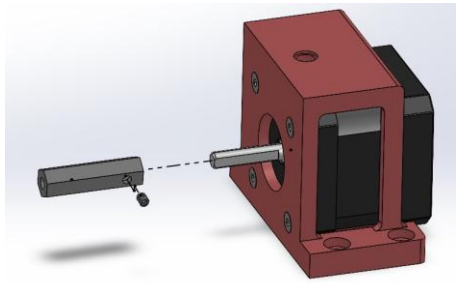


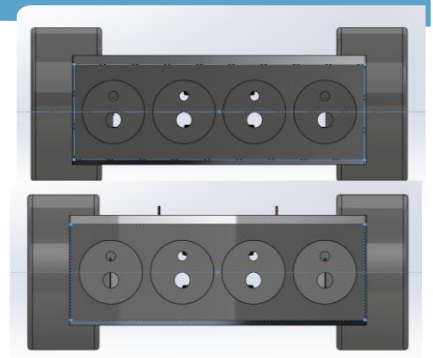
Lcamp ROBOT CONCEPT (2022)

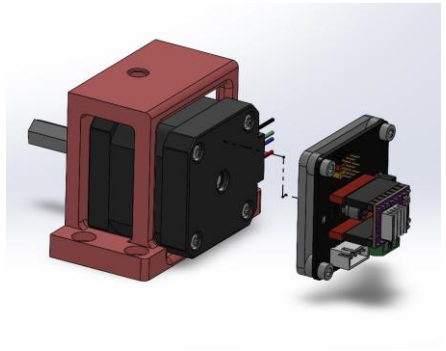


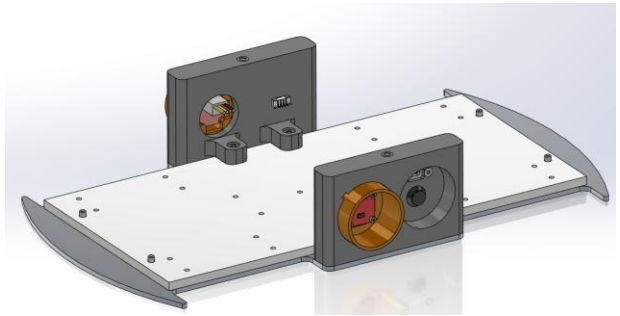
CC LCAMP ROBOT V1
(BASED ON MODELS SUPPLIED BY LCAMP PARTNERS)

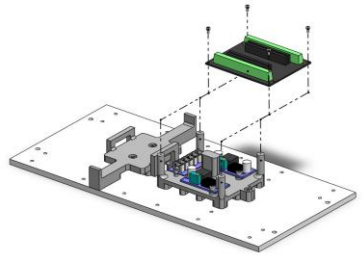


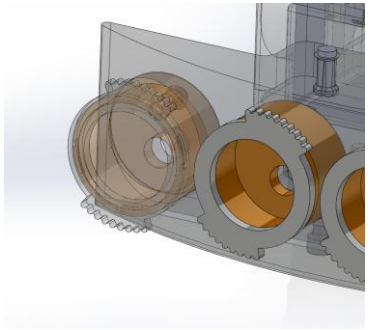


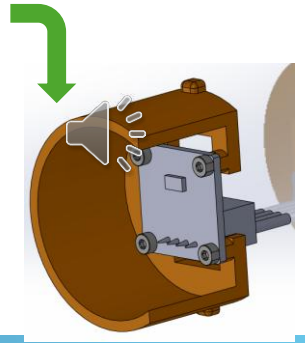




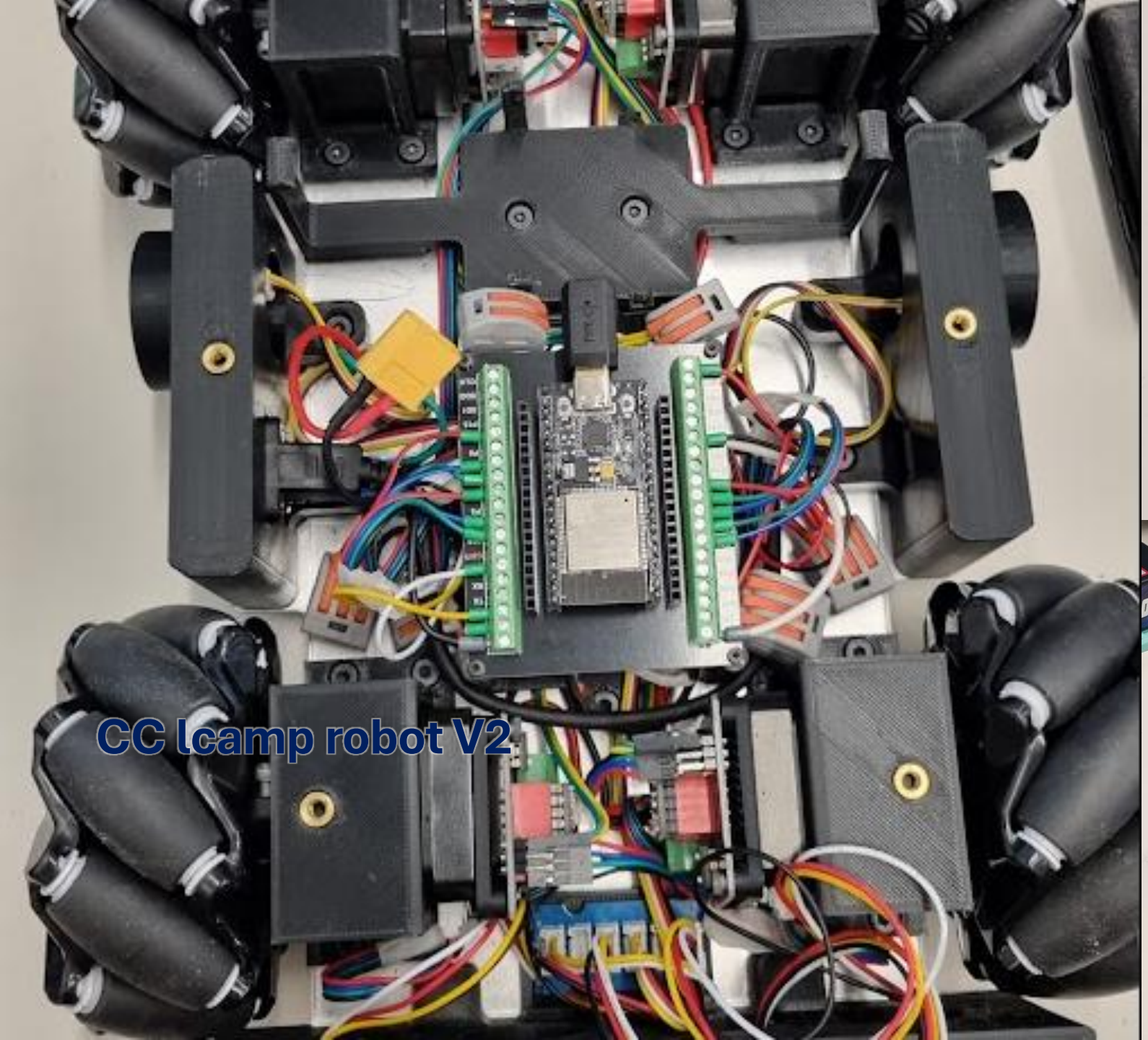




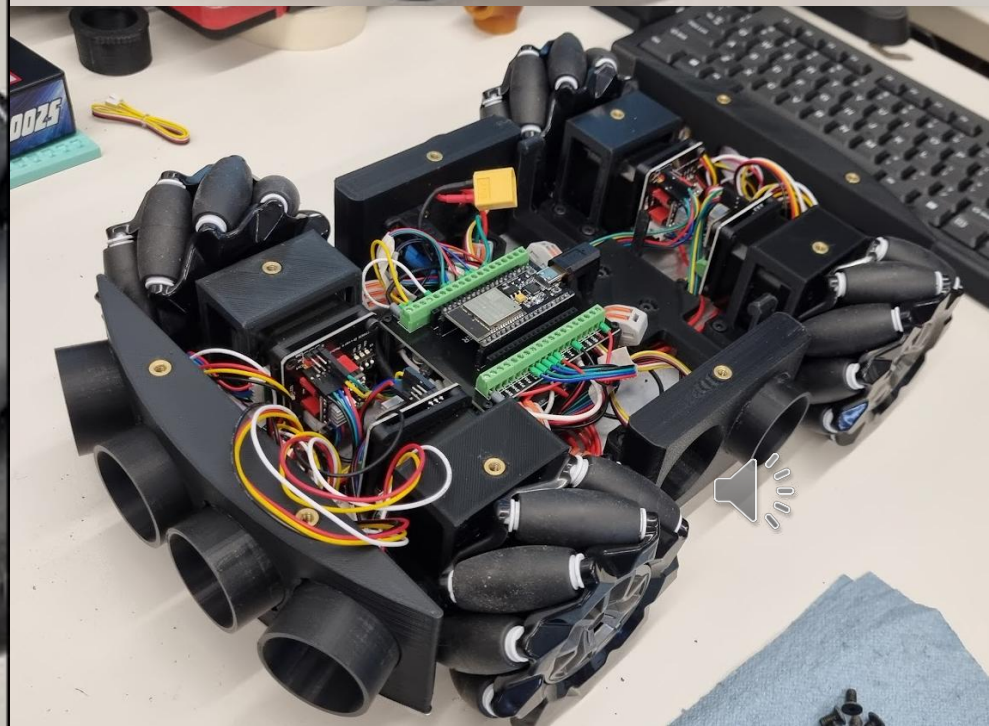




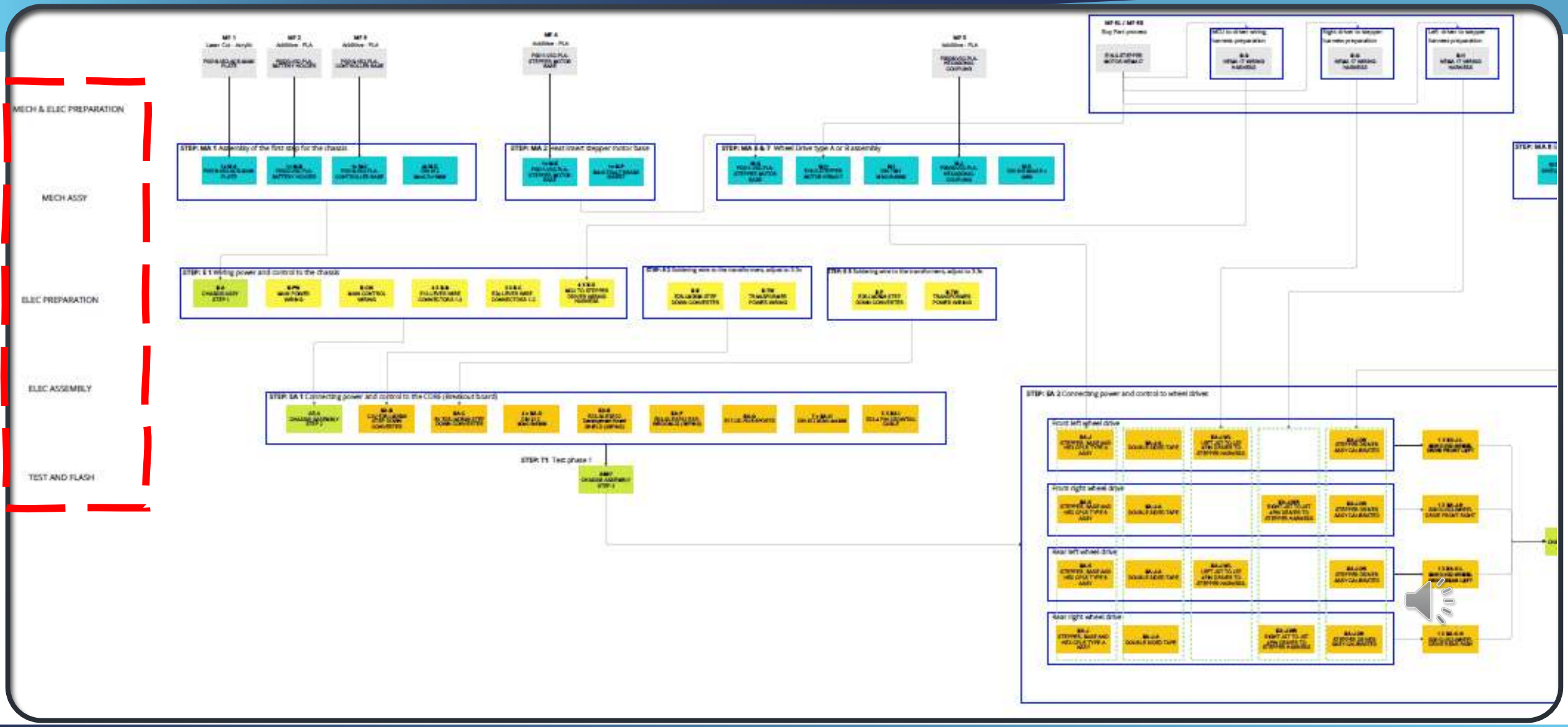
ROBOT DESIGN CHANGES

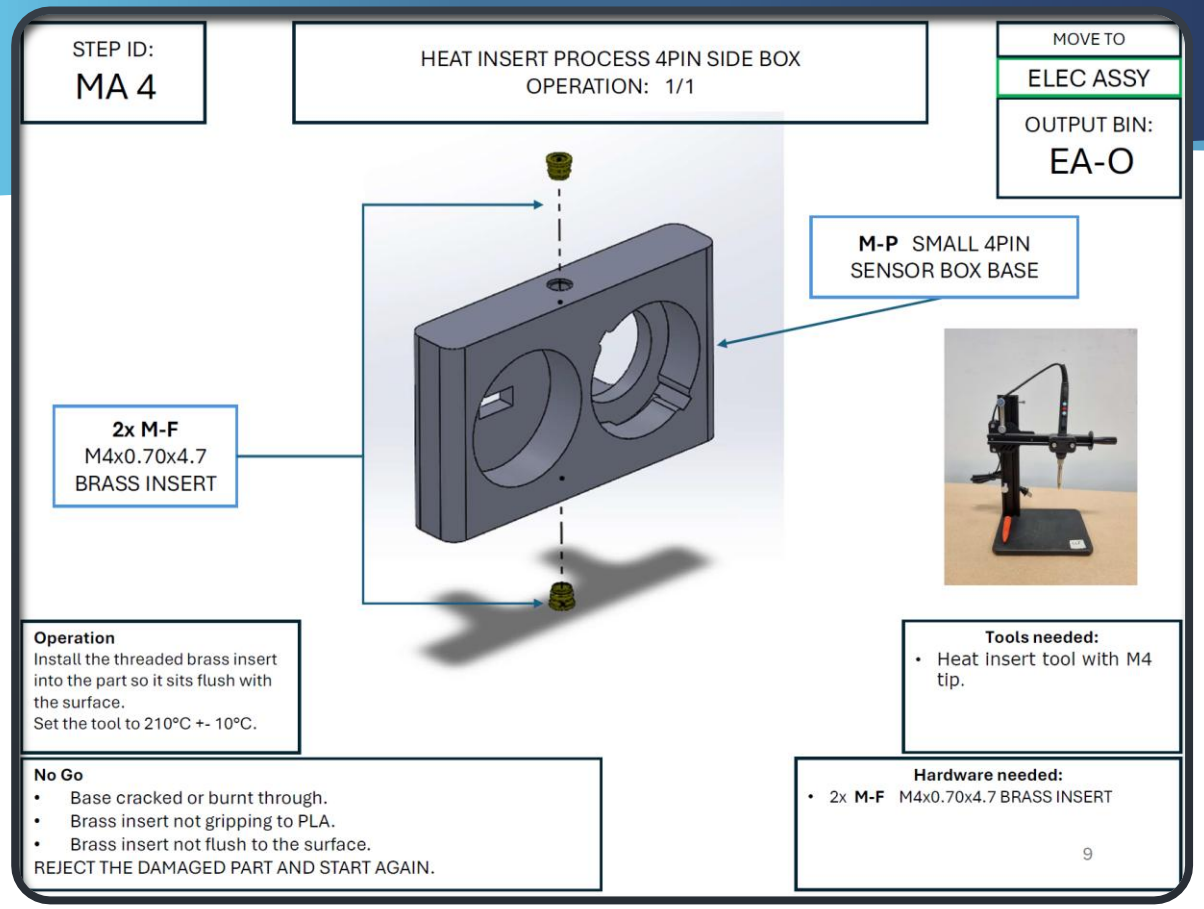

CC lcamp robot V2

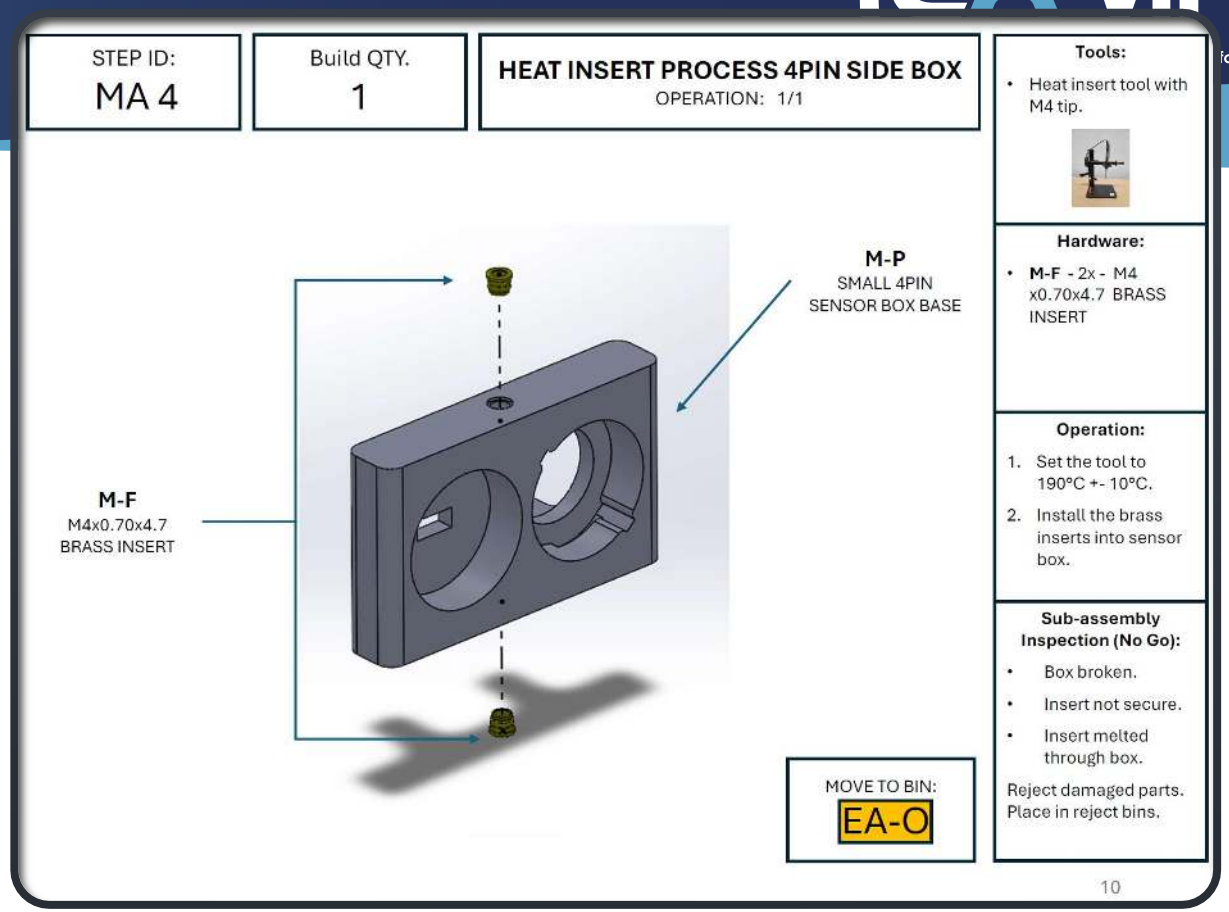




CC Robot assembly flowchart

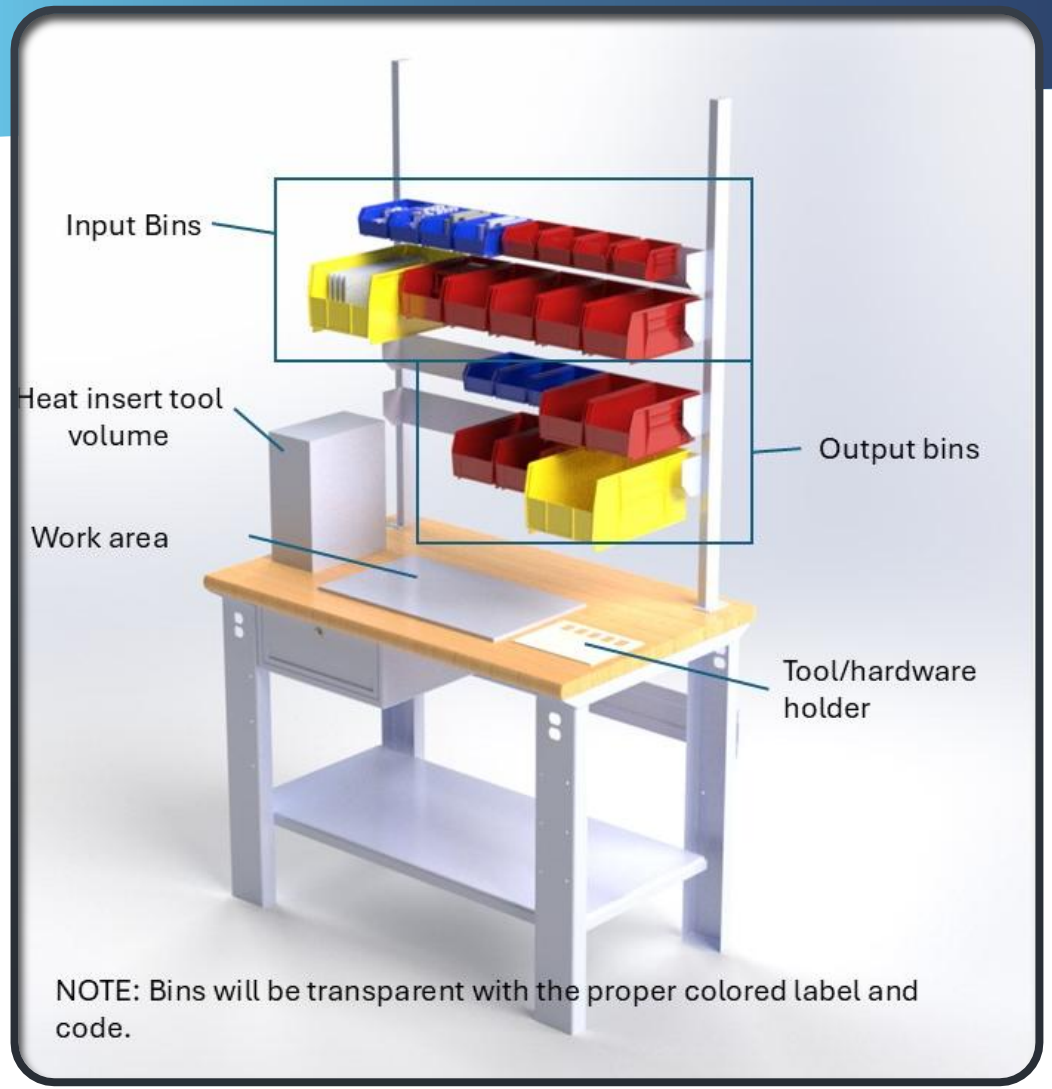






CC Robot assembly manual v1

CC ROBOT ASSEMBLY MANUAL V2





CC CLF workstationS



CC CLF NEXT STEPS:

1. Refine electrical wiring
2. Complete CLF workstations with:
    a. Digital Instruction Manual
    b. Semi automated mechanical assembly
3. Curriculum Integration
4. Automated Assembly

IMPORTANT LESSONS LEARNED:



1. PLAN AHEAD

a. Every design decision affects the manufacturing and assembly processes.

b. The assembly process informs the function and layout of the CLF workstations.

2. INVOLVE OTHER FACULTY DURING THE CLF DEVELOPMENT WORK

a. It will be easier showcase the value of the LCAMP work and to get buy-in from faculty delivering micro credentials around the CLF or adopting the robot and CLF in their existing courses.

3. MAINTAIN AN OPEN COMMUNICATION WITH OTHER PARTNERS WORKING ON WP6

a. Challenges faced by one group may have already been solved by other partners and open exchanges will expedite development.

b. Collectively, there is a significant resource pool among the various partners.

THANK YOU!

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Learning factories in partner's labs
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THANK YOU

