Joint Blueprint

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JOINT BLUEPRINT

This deliverable presents a comprehensive blueprint for designing and delivering consistent, high-quality re/upskilling programs as part of the Digital Skills Transformation Toolkit. It covers program objectives, target skills, pedagogical approaches, program format, and evaluation framework.

Priorities sum-up

Our educational programs are thoughtfully designed to meet the demands of today's labor market, equipping participants with skills that are both current and highly sought after. We achieve this by collaborating closely with industry professionals, educators, and community stakeholders, ensuring that our learning experiences are comprehensive and grounded in real-world needs. All materials and outcomes are shared openly under Creative Commons or open-source licenses, promoting a collaborative and transparent culture of learning. We take an interdisciplinary approach that breaks down traditional academic silos, allowing learners to explore and integrate diverse fields to develop creative and innovative solutions. Central to our method is the integration of digital fabrication tools and FabLab practices, offering participants hands-on experience with modern manufacturing technologies. Learning is deeply experiential and project-based, encouraging direct engagement through practical tasks and experimentation. Each educational activity is tied to real-world problems, ensuring that skills gained are immediately applicable and relevant. Furthermore, sustainability is a core value, with environmental awareness and efficient use of resources woven throughout our programs. Finally, we are committed to inclusive innovation, designing our initiatives to be accessible to all, regardless of background or prior experience, and fostering equal opportunities for success.

General principles of RE/UP Programs design in DISTT

At the project meeting In Vienna, based on their experience, desk research and communication with stakeholders, project partners agreed on the main principles of edu programs realised within DiSTT project.

Priorities of the programmes to be designed can be summarized in the following:

1. Industry Alignment: Our programs match current labor market demands, ensuring participants develop relevant, in-demand skills that enhance their employability.
2. Stakeholder Collaboration: We design our programs through active partnerships with industry experts, educators, and community members to create comprehensive and effective learning experiences.
3. Open Knowledge Sharing: All educational materials and participant outcomes are shared under open-source or Creative Commons licenses, fostering a culture of knowledge exchange and collaborative learning.
4. Interdisciplinary Integration: Our approach breaks down traditional subject boundaries by combining diverse fields of knowledge, enabling participants to develop broader perspectives and innovative solutions.

5. Digital Fabrication Integration: FabLab methodologies and tools are core components of all educational programs, introducing participants to modern manufacturing technologies and digital fabrication processes.
6. Project-Based and Experiential Learning: Learning occurs through hands-on project work and practical experimentation, allowing participants to develop skills through direct experience and active engagement.
7. Real-World Application: All learning content and activities are directly connected to real-world challenges and practical applications, ensuring immediate relevance and utility of acquired skills.
8. Sustainable Practice: Environmental responsibility and resource efficiency are embedded in all aspects of our programs, promoting awareness of ecological impact and sustainable innovation.
9. Inclusive Innovation: Our programs are designed to be accessible and beneficial to diverse groups, ensuring equal opportunities for participation and success regardless of background or prior experience.

Program objectives

From the principles (as we agreed at the meeting in Vienna) we can briefly formulate brief list of objectives as:

1. **Align education with labor market needs** to enhance participants' employability with in-demand skills.
2. **Collaborate with stakeholders** including industry, educators, and communities to co-design effective learning experiences.
3. **Promote open knowledge sharing** by using open-source or Creative Commons licenses for all materials and outcomes.
4. **Encourage interdisciplinary learning** by integrating knowledge across various fields to foster innovation.
5. **Integrate digital fabrication technologies** and FabLab methodologies into all educational programs.
6. **Implement project-based and experiential learning** to build skills through hands-on activities and real-world projects.
7. **Ensure real-world relevance** of all educational content by connecting learning to practical challenges and applications.
8. **Incorporate sustainable practices** that emphasize environmental responsibility and resource efficiency.
9. **Support inclusive participation** by designing programs accessible to diverse groups, regardless of background or experience.

Target skills

It is a skill list focused on digital fabrication and related "maker" skills. It outlines various competencies, the software/hardware involved, and which partners are involved in each skill area. Table below provides a structured overview of digital fabrication skills defined by project partners, it determines the tools and partners involved.

3D Printing / Additive Manufacturing	All partners	Operating 3D printers 3D modeling and slicing software (e.g., Cura, PrusaSlicer) Maintenance and troubleshooting of 3D printers
Laser cutting (CNC cutting)	All partners	Operating laser cutters Vector graphic design for laser cutting Material selection and settings adjustment
CNC Machining	LP1, PP4, PP2, PP5	Operating CNC machines (e.g., routers, mills) CAM software (e.g., Fusion 360, Mastercam, RhinoCAM, SprutCAM) Toolpath generation and machine setup
3D scanning	LP1, PP2, PP5	Operating 3D Scanners Scanning Techniques Post-Processing Scans Integration with CAD Applications of 3D Scanning
2D & 3D design (and computer simulation)	LP1, PP4, PP2, PP5	2D and 3D CAD software (e.g., AutoCAD, SolidWorks, Tinkercad) Parametric design, Algorithmic design Technical drawing and blueprint creation
Electronic prototyping platforms & IoT	PP4, PP2, PP5	Programming microcontrollers (e.g., Arduino, Raspberry Pi) Sensor integration and interfacing IoT (Internet of Things) development PCB design Basic electronics (Ohm’s Law, components identification) Soldering and PCB fabrication Circuit design and simulation software (e.g., KiCad, Eagle)
Robotics & Automation	LP1	Basic robotics concepts and design Assembling and programming robots Integration of sensors and actuators Understanding of automation systems PLC programming Integration of automation components
Digitally assisted crafting	PP4, PP2, PP5	Woodworking (e.g., sawing, drilling, joining) Metalworking (e.g., welding, machining) Plastics fabrication (e.g., cutting, forming)
Makers soft skills	LP, PP4, PP2, PP5	Effective communication of ideas and concepts Prototype iteration and improvement Documentation and presentation skills Teamwork and collaboration Design thinking
Ai	PP4	Machine Learning Algorithms Prompt engineering

Pedagogical approaches

All programs strongly reflect **student-centered**, **project-based**, and **experiential** pedagogies, moving away from traditional exams. PP2–PP5 integrate **self- or peer-assessment**, and all use **formative** methods. PP5 is especially modular and allows for **personalized learning paths**, while PP3 and PP4 lean heavily on **group work** and reflection.

LP1 Approaches:

- **Project-Based Learning (PBL)** FME BUT uses Project-Based Learning to cultivate critical thinking and problem-solving by engaging students in collaborative, real-world engineering projects.
- **Interdisciplinary Collaboration** FME BUT promotes cross-disciplinary collaboration through initiatives like strojLAB, where students from various engineering fields work together on diverse projects, mirroring real-world engineering environments.
- **Hands-On Experience and Maker Culture** FME BUT integrates maker culture by providing access to advanced labs and workshops like strojLAB, equipped with tools like 3D printers and CNC machines, enabling hands-on prototyping and practical skill development.
- **Student Autonomy and Reflective Learning** The curriculum is designed to promote autonomy, encouraging students to take initiative in their learning processes. Reflective practices, such as self-assessment and peer feedback, are integral components, allowing students to evaluate their progress and identify areas for improvement.
- **Design Thinking** methodology is actively integrated into education to foster creativity, user-centered problem-solving, and rapid prototyping skills among students. It is particularly emphasized in project-based courses, innovation labs and cooperation with industry partners.

The Faculty of Mechanical Engineering (FME) at Brno University of Technology (BUT) employs a dynamic and student-centered pedagogical approach that blends theoretical instruction with practical, hands-on experiences. Central to this methodology is the integration of project-based learning, interdisciplinary collaboration, and the utilization of advanced technological resources, notably through initiatives like strojLAB.

PP2 **Approaches:**

- **Project-Based Learning (PBL)** – Students work on a real-world problem provided by a company and present a tangible solution.

- **Experiential Learning** – Focus on learning through doing, including reflection on tools used and improvements.

- **Formative Assessment** – Feedback from the company and final self-assessment of skill improvement.

After the week-long project speedrun, students will present their final product/solution to the company that presented them with the task on the first day. They will explain their thought process, tools used and possible future improvements/what more they would have done if they had more time. The company will assess how well the solution solves the given problem, what was well thought through, what could be better etc. Students will then do the final assessment questionnaire, where they will compare how much they improved in the target skills.

PP3 **Approaches:**

- **Project-Based Learning** – Students build and present functional robotic prototypes.
- **Collaborative Learning** – Group work is central, and evaluation includes teamwork and engagement.
- **Experiential Learning** – Focus on hands-on creation and practical demonstration of understanding.
- **Formative Assessment** – No grades, but evaluation based on creativity, engagement, and skills development.

The approach in this workshop is formative and centered around a final group presentation of the robotic prototypes developed by the participants. Instead of written exams or scoring systems, participants are evaluated based on their engagement, creativity, and teamwork throughout the project. The final deliverable—a functional robot designed, built, and programmed by the team—is showcased and explained during a group presentation at the end of the course. This practical demonstration reflects their understanding of digital tools, problem-solving ability, and collaboration skills developed during the workshop.

PP4 **Approaches:**

- **Self-Assessment & Reflective Practice** – Students complete a self-evaluation survey at the end.
- **Project-Based Learning** (in creation-focused workshops) – Final presentations show the result of the process.
- **Minimal Formal Assessment** – Emphasizes learner ownership and reflection rather than traditional evaluation.

For every workshop there will be a self-evaluation part in the held survey at the end. For workshops that are targeted to create something there will be final presentations. A school-like and individual evaluation of the participant is not planned, as the results reflect the engagement and learnings of the people.

PP5 **Approaches:**

- **Modular, Student-Centered Learning** – Participants design their own learning paths.
- **Blended Approach (Learn-it! + Make-it!):**

  - *Learn-it!* uses **technical instruction** (similar to **scaffolded** direct learning).
  - *Make-it!* emphasizes **hands-on, experiential learning**.
- **Project-Based Learning** – Real-world digital projects as a form of assessment.
- **Self-Directed Learning** – Independent access to equipment encourages autonomy.
- **Formative Assessment** – Informal evaluations and skill verification in context.

The pedagogical approach is modular and participant-centered, enabling learners to build their ideal training path based on self-assessment and personal interests. Training activities are based on two types of modules: *Learn-it!* (technical preparatory sessions focused on skills like CAD, CAM, IoT) and *Make-it!* (hands-on workshops developing tangible prototypes). Assessment focuses on practical achievement: *Make-it!* modules culminate in the creation of real-world professional projects that highlight the potential applications of digital technologies, one for each participant. In *Learn-it!* modules, informal practical evaluations verify the correct understanding and use of tools and processes. Participants also gain independent access to Maker Space equipment for a period after the workshops, allowing additional practice and skills consolidation.

PP6 **Approaches:** The facilitator will evaluate the progress and final results of the workshop, provide a verbal summary, and invite an open discussion for peer feedback at the end of the session.

- **Formative Assessment** – Facilitator provides feedback, and peer discussion follows.
- **Peer Learning & Feedback** – Open discussion invites shared reflection and insights.
- **Experiential Learning** – Implied by the evaluation of practical outcomes.

Assessment framework

LP1 – Assessment Approach

Students are assessed using the ECTS grading scale, but in DiSTT, the focus shifts also to evaluating functional prototypes and real-world projects from hackathons and workshops. Emphasis is placed on formative feedback, self-assessment, and reflection to track growth in digital skills and collaboration. Instead of formal grades, assessment prioritizes creativity, engagement, and practical competence aligned with industry needs.

PP2 – Assessment Approach

Assessment is centered on **self-evaluation**, with participants completing structured questionnaires **both before and after each session**. These tools measure progress in **targeted skills**, including knowledge of FabLab technologies, **confidence in their use**, and development in complementary skill areas. The pre/post comparison provides individual insight into learning outcomes and areas of growth.

PP3 – Assessment Approach

The impact of the workshop is assessed through **pre- and post-program self-assessment questionnaires**, focusing on participants' **perceived confidence**, **digital tool familiarity**, and **collaborative and creative abilities**. This comparative, reflective evaluation generates **qualitative insights** into the evolution of participants' competencies—especially in **digital fabrication**, **coding**, and **teamwork**—over the course of the workshop.

PP4 – Assessment Approach

Evaluation is conducted through an **end-of-workshop survey**, where participants rate key aspects including **content quality**, **presentation effectiveness**, and **personal learning outcomes**. Though primarily focused on feedback rather than grading, this survey includes a **self-evaluation component** and functions as a tool for both **learner reflection** and **program improvement**, informing adjustments for future iterations.

PP5 – Assessment Approach

A comprehensive **multi-stage assessment framework** is implemented. Prior to enrollment, participants undertake a **guided self-assessment** to identify alignment with skill requirements for each module—particularly the more advanced **Make-it! workshops**. If skill gaps are found, learners are directed toward preparatory **Learn-it! modules**. During workshops, assessment is **experiential and practical**: participants are evaluated through the creation of **professionally relevant prototypes** (in Make-it!) and via **informal hands-on exercises** (in Learn-it!). Facilitators assess **task completion**, **skill application**, and **engagement**, supporting **continuous learning** without relying on formal grading.

PP6 – Assessment Approach

Assessment is **continuous and formative**, beginning with a **pre-workshop questionnaire** that gauges prior knowledge, skills, and expectations to shape instruction. **Ongoing in-session evaluation** tracks learner engagement and comprehension. Post-workshop, participants complete reflective questionnaires or demonstrate learning through final outputs. **Facilitator feedback**, combined with **peer discussion and a closing summary**, ensures that participants receive meaningful insights into their strengths, progress, and opportunities for further development.

Program format (sum-up)

1. Modular Learning Track: "Learn-it! / Make-it!"

Structure:

- **Learn-it!**: Weekly or on-demand technical sessions (e.g., CAD, IoT, 3D printing)
- **Make-it!**: Hands-on prototyping modules
- Optional final presentation or real-world product

Pedagogy: Student-centered, competency-based learning

Assessment:

- Self-assessment before and after modules
- Practical task completion
- Facilitator observation and informal feedback

Inspired by: PP5 + LP1 weekly modules
Best for: Long-term upskilling with practical milestones

2. Project Sprint + Mentoring Format

Structure:

- 1-3 day **hackathon/workshop** kick-off
- Weekly or bi-weekly **consultations** with a mentor or industrial partner
- Final **presentation or demo day**

Pedagogy: Project-based learning, industry-relevant skills

Assessment:

- Pre/post skill questionnaires
- Formative feedback from mentors/partners
- Peer reflection or learning journal

Inspired by: PP2, LP1
Best for: Bridging education and industry, focused team projects

3. Challenge-Based Learning + Competition

Structure:

- Team formation around real-world challenge
- Ongoing development (either 1-day or multi-week format)
- Final competitive **demo day** or public showcase

Pedagogy: Game-based and experiential learning

Assessment:

- Peer and jury evaluation
- Rubric-based scoring of innovation, feasibility, teamwork
- Optional pre/post self-assessment

Inspired by: LP1 (Pneuracer), PP2, PP3
Best for: Motivation through competition, cross-disciplinary problem solving

4. Weekly Thematic Studio

Structure:

- 13-week structure with a weekly theme (e.g., "digital prototyping," "IoT in daily life")
- Short lectures + lab or FabLab session
- Final open exhibition or pitch

Pedagogy: Blended learning, constructivist design

Assessment:

- Ongoing peer feedback
- Reflective logs / portfolios
- Instructor formative feedback on each milestone

Inspired by: LP1 (weekly teaching), PP3, PP6
Best for: Deep creative exploration, regular peer interaction

5. Fast Feedback Workshop Series

Structure:

- Multiple short (1-2 day) workshops
- End-of-session surveys with quick iteration
- No final project, focus on learning process and satisfaction

Pedagogy: Iterative learning, responsive facilitation
Assessment:

- Post-session surveys (content, facilitation, self-evaluation)
- Used to refine next session
- Optional peer insights

Inspired by: PP4
Best for: Exploratory learning environments, early-stage curriculum pilots

6. Peer-Coached Learning Circles

Structure:

- Small teams working through materials together
- Shared project or design brief
- Weekly peer review and knowledge exchange
- Optional facilitation check-ins

Pedagogy: Collaborative learning, learner autonomy
Assessment:

- Peer and self-reflection
- Shared documentation (e.g., project board, report, or video)
- Optional group pitch or review

Inspired by: PP3, PP6
Best for: Skill-building + social learning without heavy instruction

RE/UP skilling program design guide checklist

1. Define Purpose & Learning Outcomes

- What is the **main purpose** of the program (e.g., skill-building, innovation, community engagement, industry collaboration)?
- Define 3–5 **clear learning outcomes** (knowledge, skills, attitudes).
- Identify **target competencies** (e.g., CAD, teamwork, digital fabrication, confidence).

2. Choose the Program Format

- Select appropriate **structure** based on goals and context:
    - Modular (Learn-it! / Make-it!)
    - Sprint or Hackathon
    - Weekly Studio
    - Long-Term Project + Mentoring
    - Competition Format
    - Peer-Coached Circles

- Determine **duration**: One-day, multi-day, weekly (e.g., 13 weeks), or hybrid?
- Define **delivery mode**: In-person, online, blended?

3. Design Learning Activities

- Mix theory and practice (e.g., short lectures + hands-on building)
- Align activities with outcomes (e.g., teamwork, creativity, prototyping)
- Include opportunities for:
    - Making and prototyping
    - Problem-solving
    - Peer learning
    - Industry or real-world input

4. Embed Assessment Strategically

Use **formative, reflective, and experiential** assessment tools:

- Pre-workshop self-assessment (confidence, familiarity, expectations)
- Post-workshop self-assessment (learning gains, perceived growth)
- Practical outputs (prototype, presentation, pitch)
- Peer or mentor feedback
- End-of-session surveys (content quality, experience, suggestions)

Optional:

- Learning journals or portfolios
- Rubrics for project evaluation (especially for competitions)

5. Define Roles & Support

- Who facilitates? (Educators, industry mentors, peer coaches)
- Who evaluates? (Facilitator, peers, external experts)
- What is the support system for participants? (Check-ins, open lab access, Slack groups)
- Who is your credibility partner? (Enterprise, University, Influencer, Stakeholder)

6. Plan Feedback & Iteration

- Design feedback loops:
    - Participant feedback at key points
    - Quick survey after each session/module
    - End-of-program reflection

- Adjust future sessions based on feedback

- Archive insights for continuous improvement

7. Final Showcase or Closure

- Will there be a **final event**? (Presentation, competition, gallery walk)
- What will learners share? (Project demo, poster, video pitch)
- Who is the audience? (Peers, mentors, public, jury?)

8. Document and Share

- Prepare a **program brief** with structure, goals, and timeline
- Collect participant artifacts (photos, feedback, outputs)
- Optionally publish or share for visibility and scaling