Interreg CENTRAL EUROPE

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DiSTT

Joint Evaluation Report

D 2.3.1

JOINT EVALUATION REPORT

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Introduction

This deliverable presents the joint evaluation of the Pilot Runs implemented by LP1 and Project Partners PP2–PP7 within Activity 2.3 of the DiSTT project. In line with the approved activity description, it brings together the data shared through the six D2.2.1 partner reports, compares implementation and evaluation approaches, identifies practices that proved transferable, and converts the findings into recommendations for the final re/upskilling programmes and the Digital Skills Transformation Toolkit prepared under A3.3.

The report is a synthesis rather than a simple aggregation. The partners worked in different regional ecosystems, addressed different learner groups and tested different programme logics. LP1 combined a broad university- and industry-facing portfolio; PP2/PP7[1] and PP6 concentrated primarily on secondary-school learners; PP3 repeatedly tested one compact format with apprentices; PP4 connected SMEs, university teams and company apprentices; and PP5 tested bilingual adult and workforce-oriented courses. These differences are treated as evidence about adaptability, not as noise to be removed.

Joint evaluation finding. Across all six partners, the most consistent positive pattern was achieved when short theoretical inputs were followed immediately by hands-on work, participants produced a visible output, and facilitators could provide feedback during iteration. The strongest programmes connected several skills through a coherent task or prototype rather than teaching tools as isolated ends in themselves.

Purpose and scope

The objective of D2.3.1 is to share and jointly interpret Pilot Run evidence, identify best practices, challenges and lessons learned, distil the best-proven assessment tools, and provide a stakeholder report with recommendations relevant to regional policymakers. The report draws exclusively on the six supplied D2.2.1 reports and the D2.3.1 instruction document. No external evidence has been added.

The analysis covers programme purpose, target groups, regional context, delivery formats, recruitment and materials, pedagogical methods, pre/post assessment, participant feedback, instructor and external observations, skill development, stakeholder engagement and implications for transfer. It also identifies where evidence is incomplete or not comparable so that A3.3 can improve both programme content and the common evaluation architecture.

Consortium programme overview

Partner and region	Programme logic	Primary target groups	Distinctive contribution
LP1 BUT / strojLAB South Moravia, Czech Republic	Maker Engineering (ME) and Digital Manufacturing Engineering (DME); broad portfolio from short workshops to thematic studios and micro-credential pilots	University and secondary-school students, public, employees, professionals and lifelong learners	Wide technology coverage; links between academic education, makerspace practice and industry; SkillNest-based assessment and dissemination
PP2/PP7 FabLab Brno/JINTEK South Moravia, Czech Republic	High School Competition and repeated 3-5-day TechSprints	Secondary-school learners, mainly aged 15-19	Challenge-based learning, balanced team formation from pre-assessment, and real or simulated company tasks
PP3 Happylab Vienna, Austria	One repeatable three-day programme combining CAD, fabrication, robotics and programming	Apprentices from Wiener Linien, Jugend am Werk and A1	Strong test of repeatability across vocational backgrounds and employer-linked training schedules
PP4 brigk Bavaria, Germany	Short technology-entry workshops, hackathon follow-up mentoring and an apprentice series	SME employees, university teams and Bayernoil apprentices	Comparison of short introductions with longer, business-challenge and mentoring formats

[1] Following a major project modification, PP7 took over all activities previously assigned to PP2, effective from 1 March 2026.

Partner and region	Programme logic	Primary target groups	Distinctive contribution
PP5 NOI Techpark Maker Space South Tyrol, Italy	LEARN IT! structured skills courses and MAKE IT! object-based maker workshops, delivered in Italian and German	Employees, jobseekers, trainees and artisans from companies, micro-enterprises and SMEs	Bilingual workforce-oriented catalogue; repeated iteration across technical and project-based formats
PP6 FabLab Zagreb Croatia, including Slavonski Brod and Nova Gradiška	Five independent modules from idea development to 2D/3D fabrication, electronics and innovative materials	Secondary-school learners, including communities outside the capital	Modular outreach model for geographically dispersed schools and low-threshold access

Shared programme logic

Despite differences in audience and duration, the six portfolios form a coherent progression. Introductory formats reduce fear of unfamiliar technologies; focused skills courses build usable competence; challenge- and project-based formats integrate several technologies; longer mentoring and thematic studios deepen autonomy; and professional formats connect training with workplace application and recognition. This suggests that the final Toolkit should not prescribe one ideal duration. It should present a pathway of modular entry, practice, integration and specialisation.

- **Low-threshold entry:** short demonstrations, mini-workshops and beginner modules that establish confidence and reveal interest.
- **Applied skill building:** guided CAD, fabrication, electronics, programming, materials and inspection activities with clear learning outcomes.
- **Integrated challenge:** team projects that require design, manufacturing, testing, communication and presentation.
- **Deepening and transfer:** multi-session studios, mentoring, advanced modules and workplace-connected application.
- **Recognition and continuation:** certificates, portfolios, micro-credentials, memberships or follow-up modules that keep learners engaged.

Methodology - Joint synthesis and evaluation approach

The joint evaluation applied a structured cross-document synthesis. Information from corresponding chapters in the six D2.2.1 reports was mapped to the common LP1 outline and compared by partner, target group and regional context. Quantitative data were retained in the units used by each partner; qualitative findings were coded into recurring themes concerning delivery, assessment, stakeholder cooperation and transferability.

Partner labels in this report follow the consortium assignment used for this synthesis: LP1 and PP2–PP7.

Evidence base

Source	Coverage used	Important qualification
LP1 D2.2.1	ME and DME portfolio; delivery, assessments, stakeholder survey and external evaluation	Participant places are not necessarily unique persons; pilot-specific scales and samples differ
PP2/PP7 D2.2.1	Competition and TechSprint implementation, assessment results and residency feedback	Some pre/post samples were incomplete; one reported instrument produced values not directly comparable with five-point results
PP3 D2.2.1	Nine repeated apprentice runs and a harmonised seven-item assessment	Programme-level, not individually matched, pre/post comparison
PP4 D2.2.1	Three activity streams, mixed-method evaluation and lessons learned	No separate stakeholder-report chapter; assessment-tool access/export constraints were reported
PP5 D2.2.1	Eighteen bilingual runs, technical gains, satisfaction and adaptations	Participant places are not necessarily unique persons; anonymous, unmatched pre/post; small per-run samples
PP6 D2.2.1	Five modules, 13 group implementations and detailed aggregate pre/post results	Modular participations are not unique people; no separate company survey or residency evaluation was supplied

Comparison method and safeguards

The analysis distinguishes four levels of evidence. Delivery evidence describes what occurred; perceived-learning evidence reports changes in self-assessed confidence or competence; application evidence comes from practical outputs and observations; and stakeholder evidence concerns external relevance, uptake and policy implications. A conclusion is treated as consortium-level when it appears across several partners or is supported by different evidence types.

- **No false precision:** participant places, modular participations and unique learners are not treated as interchangeable.
- **No common impact score:** different questions, scales, respondent groups and pairing methods prevent a valid consortium-wide mean gain.
- **Transparent limitations:** missing post-responses, unmatched samples, self-report bias and evidence gaps are retained in the interpretation.
- **Triangulation:** self-assessment is interpreted alongside prototypes, practical tasks, facilitator observations, presentations and stakeholder feedback.
- **Transfer focus:** best practice requires both positive evidence and a credible route for reuse by another FabLab or training provider.

Common evaluation architecture

All partners used mixed methods, but with different emphasis. LP1 progressively centralised assessment through SkillNest.app; PP2/PP7 and PP4 relied strongly on Mentimeter for accessible group assessment; PP3 retained the same seven questions across repeated runs; PP5 used mirrored online pre/post instruments and satisfaction questions; and PP6 used module-specific five-point items, open responses and observations. Practical outputs were central in every portfolio, even when no formal rubric was used.

For D2.3.1, assessment results are therefore interpreted primarily as evidence of perceived development and programme responsiveness. The most methodologically credible examples were those with identical pre/post questions, stable scales, high completion, anonymous matching identifiers, and an additional practical or observational check.

Pilot RUN Data

Cross-partner delivery overview

Partner	Implementation reported	Participation reported	Delivery hours reported
LP1	23 Pilot Runs	353 participant places	339 hours; 5,510 participant-hours
PP2/PP7	2 competition runs + 10 TechSprints	309 participant places	390.5 hours from the supplied overview
PP3	9 repeated three-day runs	67 apprentices	189 scheduled hours
PP4	3 activity streams: mini-workshops, hackathon follow-up and apprentice series	58 participants	71 hours
PP5	18 delivered runs; 1 cancelled	107 participants	241 hours
PP6	5 modules; 13 module-group implementations; 27 meetings	109 modular participations	315 hours

Taken at face value, the partner tables document approximately 1003 participant places or modular participations and at least 1,545.5 reported delivery hours. These figures are useful as an order-of-magnitude indication of consortium reach, but they must not be presented as a count of unique people or as a fully harmonised output indicator.

Delivery patterns in relation to the re/upskilling programmes

The pilots tested three complementary implementation strategies. LP1 and PP5 maximised breadth by offering diverse topics and formats. PP3 maximised repetition by running one stable format nine times. PP2/PP7, PP4 and PP6 occupied the middle ground: they retained a common pedagogical logic while varying challenge topics, module content, duration or learner setting. Together, these strategies provide different types of validation.

- **Breadth validates portfolio fit.** LP1 and PP5 show that a common programme framework can host technologies ranging from CAD and additive manufacturing to electronics, inspection, CNC, CAE and Design Thinking.
- **Repetition validates operational transferability.** PP3 demonstrates that a three-day core design can be reused across apprentice groups when pacing, scaffolding and optional extensions remain flexible.
- **Contextual adaptation validates reach.** PP2/PP7 and PP6 adapted delivery to schools and varying prior knowledge, while PP4 compared company, university and apprentice contexts.
- **Iteration validates programme learning.** PP4 revised its Generative AI workshop, PP5 discontinued an over-scoped charging-station format, and several partners refined instructions, team formation or assessment during piloting.

Regional and target-group comparison

Context	Observed need	Effective response	Transfer implication
University learners and early-career engineers (LP1)	Integrate advanced tools with real engineering decisions and employability	Thematic studios, hackathons, industrial mentors, portfolio outputs and micro-credential pilots	Connect technology modules to authentic projects, external review and recognition

Context	Observed need	Effective response	Transfer implication
Secondary schools (PP2/PP7, PP6; also LP1)	Early exposure, confidence, teamwork and orientation toward technical study/work	Short explanations, visible outcomes, balanced teams, accessible tools and staged challenges	Provide beginner-safe starter tasks, explicit roles, consent/data safeguards and school-ready schedules
Apprentices (PP3, PP4)	Complement vocational training with interdisciplinary digital fabrication	Compact multi-day projects coordinated with employers or training providers	Recruit through institutions and use one coherent prototype to link several skills
SMEs, employees and adult learners (LP1 DME, PP4, PP5)	Operational relevance, limited time, varied prerequisites and demand uncertainty	Short entry offers plus structured or mentored follow-up, practical business challenges and specialist modules	Verify prerequisites, frame value clearly, reduce no-shows and offer progression
Geographically dispersed communities (PP6)	Limited access to specialised infrastructure and facilitation	Place-based school delivery and independent modules	Fund mobile/outreach capacity, consumables and local partnerships
Multilingual region (PP5)	Access in both Italian and German	Parallel bilingual implementation	Toolkit materials should be translation-ready and retain local terminology and safety instructions

Communication, outreach and recruitment

Recruitment routes were most effective when embedded in trusted institutions. LP1 used university courses, strojLAB channels, schools, public events and industry networks. PP2/PP7 worked directly with schools; PP3 recruited through apprenticeship organisations and employers; PP5 used the NOI website, newsletter and Maker Space community; and PP6 delivered through school and local FabLab relationships. PP4's experience shows that general promotion of short workshops does not automatically create demand, particularly for specialised topics.

Target-specific messaging mattered. Young learners responded to practical challenges, teamwork and making a tangible object. Apprentices and employers responded to a compact schedule and connection to vocational development. Employees and professionals needed clear business relevance, prerequisites, access to specialised equipment and a credible progression route. Free or broadly advertised offers require confirmation reminders, waiting lists and a clear statement of expected commitment to reduce no-shows.

Participant materials and delivery readiness

Across the consortium, the most useful participant packages combined concise presentations with step-by-step instructions, starter files, worksheets, example code or CAD templates, equipment access and safety guidance. LP1 additionally used university e-learning, recorded strojTALK content and SkillNest pages; PP3 identified the need for kit checklists and tiered challenge cards; PP5 showed the value of pre-produced components when fabrication time exceeded a short session; and PP6 recommended starter galleries, quick-reference cards and shared digital folders.

The joint lesson is that a transferable workshop is more than a syllabus. It needs a facilitator pack covering timing, preparation, expected outputs, prerequisite checks, equipment function checks, consumables, safety, troubleshooting, adaptations for different levels, assessment questions and a recovery plan when machines, materials or time become limiting.

Pedagogical approaches across partners

All six partners converged on learner-centred, practice-oriented pedagogy. Project- and challenge-based learning dominated the longer formats; demonstration followed by immediate practice worked best in short formats; and mentoring supported the transition from an initial idea to a feasible prototype. Iteration, testing and discussion of error were treated as normal parts of learning.

The strongest learning designs have balanced structure and autonomy. Excessively open tasks could lead to easy solutions, uneven team contribution or loss of time. Excessively compressed instruction could force facilitators to omit the most valuable practical element. Successful formats therefore used a clear minimum outcome, optional advanced tasks, checkpoints and targeted help without prescribing one final solution.

Evaluation

Pre- and post-assessment findings

Every partner reported positive development in technical competence or confidence. The magnitude cannot be compared as a league table, but the direction is consistent: the largest changes occurred in skills with low entry familiarity and intensive hands-on practice. Soft skills usually started from higher self-ratings and changed less, especially in short formats.

Partner	Selected quantitative evidence	Interpretation boundary
LP1	Representative five-point gains ranged from +0.89 (Design Thinking) to +1.98 (metal powder AM); all seven paired Design Thinking respondents improved	Pilot-specific instruments and mostly unmatched group samples; results show perceived development
PP2/PP7	TechSprint: mean gains included +1.4 for printer operation, about +1.0 for modelling/slicing and smaller soft-skill changes; Competition reported large hard-skill increases	Post-response attrition and instrument inconsistencies limit precise comparison
PP3	Seven-item mean increased from 2.61 to 3.85 (+1.24); laser cutting +2.21, 3D printing +1.87, robot programming +1.63	55 pre and 49 post responses analysed at programme level, not individually matched
PP4	Hard skills increased by approximately two points on average; soft skills improved more modestly	Mixed instruments and activities; pre-assessment overconfidence was observed
PP5	CAD Basics rose from about 1.6 to 3.7–3.9; CAM/CNC from 1.6 to 3.5; Arduino gains roughly 1.5–2.5 points; satisfaction about 4.6/5	Most complete quantitative instruments came from later runs
PP6	Module means increased by +2.20 to +3.08; all modules ended above 4.1/5	Aggregate, unmatched module samples; Module 4 had 31 pre and 32 post responses

High gains should not be interpreted as proof that one programme was more effective than another. They are partly influenced by baseline knowledge, question wording, exposure time, scale design and respondent composition. For example, teamwork often changed little because participants initially rated it highly, while low-baseline machine skills could rise sharply after one successful practical experience.

Participant feedback

Participant feedback consistently favoured practical work, visible results and supportive facilitation. LP1 participants valued hands-on digital fabrication and project outputs, while asking for clearer course structure and more project time in longer formats. PP2/PP7 learners achieved rapid progress under challenge pressure, although some found the approach unfamiliar or uncomfortable. PP3 apprentices most often highlighted modelling, 3D printing, laser cutting and the robot challenge. PP5 reported high satisfaction, especially in focused formats such as the tool tray. PP6 learners responded strongly to immediate effects such as a cut part, printed model, illuminated LED or visible material reaction.

Requests for improvement also converged. Participants wanted more experimentation time, clearer prerequisites, differentiated guidance for programming and CAD, better alignment between theory and the main project, and support that makes complex tasks achievable without removing autonomy. Feedback completion was highest when collected before participants left or through a live retrospective; passive post-event surveys produced weaker response rates.

Instructor observations

Facilitators across the consortium observed that early success builds confidence. A simple tag, working circuit, laser-cut element, structured problem statement or first functioning robot movement made progress visible and reduced anxiety. Close mentoring was especially important when learners had no prior experience or when several technologies had to be combined.

The recurring operational constraints were uneven starting levels, insufficient time for fabrication and debugging, equipment bottlenecks, safety supervision and task scope. LP1's longer university formats also revealed coordination burden and the risk that introductory exercises compete with the main project. PP2/PP7 observed uneven participation within some whole-class teams. PP3 identified the need for kit function checks and tiered programming help. PP5 demonstrated that prerequisite failure and over-scoped projects can justify redesign or discontinuation. PP6 stressed facilitator-to-team ratios, consumables and safe handling.

Tandem, residency and external observations

Cross-partner observation was documented most clearly between LP1 and PP2/PP7. Martina Michlovská of PP2/PP7 evaluated both LP1 strojLAB Challenge hackathons, while David Škaroupka of LP1 joined the final evaluation committee for PP2's high-school competition. The exchange confirmed the value of Mentimeter, final presentations and the use of pre-assessment to form balanced teams. Tomáš Mejzlík of FabLab Brno also evaluated LP1's ZPC course and highlighted challenge-based learning and just-in-time technical training while recommending stronger attention to the user and purpose of the solution.

LP1's residency visitor, Belgian industrial designer Tanguy Prevot, rated the ZPC project-based approach highly and considered its combination of technologies relevant to employability. His principal recommendation was to add business and commercial thinking and to control project complexity more explicitly. PP3's external exchange with the Federation of Austrian Industries explored recruitment-oriented projects, longer apprenticeship support and makerspace offers for employees. PP5 hosted a transnational residency visit: Max Hofedank of PP4 attended the German MAKE IT! tool-tray workshop in Bolzano on 28 November 2025 and provided written feedback, which enabled comparison of PP5's short object-centred format with PP4's mentoring-based approach and joint reflection on SME recruitment. PP6 exchanged information with its tandem partner PP3 during the pilot phase, sharing plans and initial feedback from attendees. During the intensive pilot implementation, PP6 involved teachers to observe the process and provide their opinions, which were positive regarding the methodology. Identified gaps should remain visible rather than being inferred as completed activities.

Impact on skills development

Skill domain	Consortium evidence	Most relevant partners / formats
Digital design and CAD	2D/3D modelling, parametric design, dimensioning, model preparation and printability	LP1, PP2/PP7, PP3, PP5, PP6
Digital fabrication	3D printing, laser cutting, CNC/CAM, file preparation, machine operation and safety	All partners; especially integrated projects and focused skills courses
Electronics and programming	Arduino, Calliope, sensors, actuators, embedded logic, debugging and AI-assisted development	PP2/PP7, PP3, PP4, PP5, PP6; selected LP1 runs
Advanced manufacturing and inspection	Metal AM, robotic printing, 3D scanning, metrology, CAE and manufacturing constraints	Primarily LP1 DME/ME and PP5 LEARN IT!
Innovation methods	Problem framing, Design Thinking, requirements, ideation, iteration and prototype validation	LP1, PP4, PP6 and challenge-based PP2/PP7
Sustainability and materials	Recycled/recyclable and smart materials, material choice and practical processing	PP6 and relevant LP1 or PP5 fabrication activities
Transversal competence	Teamwork, communication, task distribution, presentation, planning, autonomy and confidence	All partners; strongest evidence in team challenges and final demonstrations

The strongest consortium contribution is the combination of hard and transversal skills within a complete workflow. Learners did not only encounter a machine or software package; they had to interpret a task, prepare data, manufacture or program an outcome, deal with error, cooperate and explain the result. This integrated competence is particularly relevant to digital transformation because workplace performance depends on connections between tools, people and decisions.

Best Practices and Challenges

What worked well

Best practice	Cross-partner evidence	Recommendation for reuse
Immediate practice after concise explanation	Consistent across all six partners; especially effective with beginners and short attention spans	Keep theory blocks short and attach each concept to a task, demonstration or test
One coherent, tangible outcome	Prototypes, robot challenges, fabricated parts, circuits and transformed materials drove motivation	Design each module around a visible minimum outcome and documentable result
Real or credible challenge context	Industry tasks, student competitions, apprenticeship projects and user-centred assignments increased relevance	Use authentic briefs with clear users, constraints and success criteria
Small teams with guided roles	Supported mixed levels, peer learning and equipment sharing	Use pre-assessment for balanced teams and define roles, checkpoints and contribution expectations
Tiered difficulty	Optional sensors, advanced programming and graded exercises kept faster learners engaged	Provide beginner core tasks plus clearly marked extensions
Iteration and feedback	Mentoring, test cuts, debugging, prototype review and project consultations deepened learning	Budget time for failure, correction and a second attempt
Institutional recruitment	Schools, apprenticeship providers, employers and university courses delivered reliable target-group access	Recruit through organisations that can align attendance with learner schedules
Final demonstration and recognition	Presentations, juries, certificates and portfolio outputs reinforced achievement and communication	End with a demonstration, short reflection and reusable evidence of participation
Reusable facilitator package	Partners repeatedly requested checklists, templates, starter files and troubleshooting guidance	Treat preparation and adaptation instructions as core Toolkit content

Identified challenges and mitigation

Challenge	Evidence	Joint mitigation
Uneven prior competence	Reported by LP1, PP2/PP7, PP3, PP5 and PP6	Use a short diagnostic; set prerequisites; form balanced teams; provide core and advanced tracks
Scope exceeds available time	LP1 long-format overload; PP4 short AI limits; PP5 charging-station redesign; repeated requests for more practice	Define a minimum viable output, remove non-essential content, pre-produce slow components and add follow-up options
Unequal team contribution	Observed in some PP2/PP7 whole-class groups and implicit in open project formats	Assign roles, use contribution checkpoints and require every participant to demonstrate or explain part of the output
No-shows and uncertain demand	PP4 cancelled low-demand workshops; PP5 experienced no-shows in free/specialised courses	Use demand testing, confirmations, reminders, waiting lists, deposits where appropriate and shorter registration lead times
Equipment and safety bottlenecks	Machines, kits, components, heat processing and facilitator capacity constrained simultaneous work	Specify group size, machine ratio, consumables, safety procedures and contingency activities before recruitment
Incomplete or unmatched assessment	Lower post-response, missing identifiers and unequal samples occurred across several partners	Complete post-assessment before departure and use stable anonymous matching codes
Self-assessment bias	Overconfidence and recalibration were reported, especially by PP4 and in soft skills	Triangulate with practical criteria, observation and a final demonstration
Industry engagement requires brokerage	PP2/PP7 struggled to secure company challenges; LP1 companies favoured low-threshold engagement	Offer a clear cooperation menu with effort, benefits, outputs, contact point and in-kind options
Digital assessment infrastructure	PP4 reported access and export limitations; partners used multiple platforms	Use SkillNest as the common backbone and ensure export, ownership, privacy and offline fallback

Best-proven assessment tools

The consortium evidence supports a compact mixed-method assessment cycle. No single instrument was sufficient; the strongest evidence emerged when short self-assessment was combined with observable application and immediate qualitative feedback.

- **1. Registration and diagnostic pre-assessment.** Collect target-group information, prerequisites and three to six learning-outcome items. Use the result to adjust pacing and, where relevant, team composition.
- **2. Identical, short post-assessment.** Repeat the same competence items and scale before participants leave. Add one progress item and no more than two open questions.
- **3. Anonymous matching code.** Enable paired analysis without unnecessary personal data. Registration, name or nickname may be used only where appropriate and transparently communicated.
- **4. Practical-output criteria.** Use a small rubric covering safe execution, task completion, technical correctness/function, iteration and explanation.
- **5. Facilitator observation checklist.** Record independence, troubleshooting, teamwork, use of feedback and recurrent obstacles during delivery.
- **6. Demonstration, presentation or external review.** Verify application and communication while connecting learning to users, industry or peers.
- **7. Immediate retrospective.** Use Mentimeter, a brief oral round or a short open field to capture what helped and what remained difficult.
- **8. Selective follow-up.** For longer programmes or workforce cohorts, use a short later interview or survey to assess workplace transfer; reserve personal calls for strategically important small cohorts.

SkillNest.app should host the common core questions, partner-specific additions, anonymous identifiers, exportable results and links to output rubrics. The Toolkit should preserve a small mandatory core while allowing technology- and target-group-specific items.

Recommendations for refining the re/upskilling programmes

- Define a modular pathway from beginner entry to applied project and advanced specialisation rather than forcing all content into one workshop.
- State prerequisites and minimum outcomes clearly; provide a short preparatory module when advanced CAD, programming or machine knowledge is required.
- Start longer projects early and ensure that lectures, exercises and mini-projects directly support the main task.
- Include customer, user, value and feasibility considerations in technical challenges, particularly for university and company-facing formats.
- Design team roles and interdisciplinary contributions explicitly, including technical, user/business and documentation perspectives.
- Offer portfolio-ready outputs, certificates or micro-credential pathways where the target group benefits from formal or visible recognition.
- Document both successful and discontinued formats so Toolkit users can understand the conditions under which a design should be adapted or rejected.

Stakeholders Report

Evidence base and cross-partner findings

Stakeholder evidence was unevenly distributed. LP1 provided the most extensive employer survey and a six-person stakeholder evaluation of the ZPC course. PP3 documented cooperation with three apprenticeship organisations, the Federation of Austrian Industries and Jugend am Werk. PP2/PP7 involved schools, teachers, companies and an external final committee, but also reported difficulty securing company participation in challenge design. PP4 embedded SMEs and Bayernoil in delivery but did not provide a separate stakeholder chapter. PP5's report focused on workforce needs and community recruitment. PP6 stated that no separate company survey or policymaker consultation was included but they involved teachers as the main stakeholder observer.

The joint findings below therefore distinguish direct stakeholder statements from implementation-based implications. The absence of a formal survey from certain groups of stakeholders is not treated as negative evidence; it identifies a data gap for future implementation.

Stakeholder demand and cooperation patterns

Finding	Evidence across partners	Implication
Hands-on, visible and challenge-based learning is credible	LP1 stakeholder committee rated ZPC highly; apprenticeship and school partners continued participation; practical formats drew strong feedback	Use working prototypes and authentic tasks as the primary value proposition
Short formats are the easiest entry point	LP1 companies preferred short workshops; PP3's three-day format fit apprentice schedules; PP5's focused formats performed well	Offer low-threshold entry with a clearly signposted route to deeper learning
Companies often enter through talent rather than employee training	LP1: recruitment/employer branding dominated motivations and 75% were positive toward active student cooperation	Use lectures, internships, challenges and mentoring as a staged path toward co-designed upskilling
Employers need a clear cooperation proposition	PP2/PP7 struggled to attract company challenge providers; LP1 stakeholders found industry cooperation insufficiently explained	Publish standard engagement packages with roles, time, benefits, deliverables and IP/data terms
Vocational intermediaries are powerful multipliers	Wiener Linien, Jugend am Werk, A1 and Bayernoil enabled apprentice access and schedule integration	Fund and involve training managers, apprenticeship providers and sector bodies as brokers
Workforce learning must solve an operational need	LP1 DME, PP4 and PP5 showed demand sensitivity, prerequisite issues and application concerns	Frame each offer around a business task, expected capability and follow-up use
Regional access and language matter	PP6 reached communities outside Zagreb; PP5 delivered in Italian and German	Support place-based delivery, translation-ready materials and local facilitation

Employer evidence as a consortium reference point

The LP1 Company Day data provide the most detailed quantitative employer signal in the supplied sources. Of 44 company records, 33 (75%) indicated active or rather active willingness to cooperate with students and eight more preferred a presentation-only mode. Guest lectures and workshops were the most frequently selected cooperation format (26 companies), followed by internships or traineeships (16). Recruitment and employer branding were selected by 35 companies (80%).

Technology interests were distributed rather than concentrated in one topic: Design Thinking led with 11 selections, followed by polymer 3D printing (10), Arduino/PLC (9), metal 3D printing and Fusion/CAD-CAM (7 each), optical scanning (6), robotic 3D printing and laser cutting (4 each), and algorithmic modelling (2). This supports a modular catalogue rather than one fixed course for all companies. Immediate employee-upskilling interest was lower than student cooperation, indicating that the pathway to professional training should begin with a concrete, low-risk collaboration and demonstrated value.

Key recommendations derived from Pilot Runs

- **Recognise FabLabs, university labs and makerspaces as skills infrastructure.** Their role includes brokerage, facilitation, equipment access, experimentation and links between schools, learners and employers—not merely access to machines.
- **Fund modular pathways, not isolated events only.** Entry workshops should connect to follow-up projects, advanced modules, mentoring, open-lab access, memberships or micro-credentials.
- **Resource the hidden delivery capacity.** Facilitator preparation, equipment checks, consumables, safety supervision, translation, data collection and maintenance are essential programme costs.
- **Support regional brokerage with employers.** Provide intermediaries and standard cooperation models for challenge briefs, lectures, internships, mentoring, materials and employee training.
- **Use talent-pipeline cooperation as an on-ramp.** Student projects and apprentice programmes can build trust before companies commit to deeper innovation or workforce-upskilling partnerships.
- **Promote inclusive territorial access.** Support outreach to schools and communities outside major cities, low-threshold beginner formats and materials in relevant regional languages.
- **Enable recognition of applied skills.** Connect practical outputs and assessment evidence to certificates, portfolios, micro-credentials and regional lifelong-learning frameworks.
- **Adopt a common evidence standard.** Require short matched pre/post instruments, practical evidence, observation and transparent reporting of non-response and unique-versus-repeat participation.
- **Integrate the Toolkit into regional innovation and labour-market strategies.** Use it as an adaptable implementation resource for digital manufacturing, entrepreneurship, sustainability and vocational transition.

Residency visits and external evaluation

The documented residency and external-evaluation activities demonstrate the value of cross-perspective review. LP1 and PP2/PP7 used a reciprocal committee (as well as PP4 and PP5) and hackathon observation to validate challenge-based education and exchange assessment practices. LP1's external residency visitor added an industrial-design and employability perspective, identifying customer value and project scoping as missing elements. PP3's industrial association exchange explored pathways for the future company uptake. PP6 teachers´ observations yielded insightful feedback.

For future use, each external review should record date, host, reviewer role, programme observed, evidence examined, strengths, required changes, transfer implications and agreed follow-up. This will make residency observations comparable and actionable rather than anecdotal.

Relevance for regional and EU level

Level	Relevance demonstrated	Recommended uptake route
Regional skills ecosystems	Local labs connected universities, schools, apprenticeship providers, SMEs, companies and community learners	Include labs and makerspaces in skills, innovation, STEM and smart-specialisation actions

Level	Relevance demonstrated	Recommended uptake route
Manufacturing and SME transformation	Pilots covered CAD/CAM, additive manufacturing, electronics, AI, programming, inspection and prototyping	Use modular needs-based offers and real company challenges with follow-up support
Vocational education and apprenticeships	PP3 and PP4 showed that compact external programmes complement formal workplace training	Develop partnerships with employers, chambers, apprenticeship bodies and training providers
Youth inclusion and orientation	PP2/PP7 and PP6 provided early, accessible experience with digital technologies and teamwork	Fund school partnerships, outreach delivery and progression into further study or technical careers
Lifelong learning and recognition	LP1 DME and other adult formats tested specialist learning and micro-credential logic	Align assessment and practical outputs with regional and European recognition frameworks
EU transferability	Shared pedagogical patterns worked across Czech, Austrian, German, Italian and Croatian settings	Distribute adaptation-ready Toolkit modules through SkillNest with localisable materials and common evidence fields

The principal EU-level value is not uniformity but structured adaptability. A common workshop record, facilitator package and assessment core can coexist with different languages, equipment, durations, target groups and industrial profiles. This is the appropriate basis for transfer across Central Europe.

Conclusion and Next Steps

The joint evaluation confirms that the six DiSTT partner portfolios produced a substantial and diverse evidence base for practical digital-skills transformation. The pilots reached learners from secondary schools, universities, apprenticeships, companies, SMEs, jobseeking and maker communities. Although the delivery data and assessment instruments are not fully harmonised, the direction of results is consistent: participants gained confidence and perceived competence most clearly when they used technologies directly, created a tangible output and received feedback while solving a meaningful task.

The evaluation also shows that transferability depends on operational detail. Effective uptake requires clear prerequisites, realistic scope, differentiated tasks, adequate facilitator and equipment capacity, safe working procedures, reusable files and templates, a credible recruitment route and an assessment method that is short enough to complete yet rich enough to inform improvement.

Improvements for re/upskilling programmes

- Organise each programme as a sequence of entry, core practice, integrated challenge and optional advanced continuation.
- Use pre-assessment to verify prerequisites, adapt pacing and compose balanced teams; communicate minimum and advanced outcomes before delivery.
- Protect hands-on and iteration time by shortening theory, preparing slow components and avoiding parallel exercises that do not support the main task.
- Strengthen user, customer, business and sustainability framing so technical outputs are assessed for relevance as well as functionality.
- Standardise the common evaluation core while preserving partner-specific questions and target-group safeguards.
- Close the feedback loop: document what changed after each run and why, including formats that were discontinued or redirected.
- Build continuation into programme design through mentoring, follow-up modules, open access, membership, certification, portfolio use or company projects.

Inputs for further implementation (A3.3)

The following actions should be implemented in the Digital Skills Transformation Toolkit and SkillNest.app. They translate the partner evidence into a common, reusable delivery system while retaining local adaptability.

Priority action	Minimum Toolkit content	Expected benefit
Common workshop record	Purpose, target group, prerequisites, duration, group size, equipment, safety, outcomes and adaptation options	Allows educators to judge feasibility before adoption
Facilitator implementation pack	Timed agenda, preparation and function checks, starter files, examples, troubleshooting and contingency plan	Reduces preparation burden and protects productive workshop time
Learner package	Concise instructions, worksheets, templates, reference cards and links to further learning	Supports autonomy and reuse after the workshop
Assessment core in SkillNest	Three to six matched items, anonymous code, progress item, open feedback, export and partner-specific additions	Improves comparability, completion and data quality

Priority action	Minimum Toolkit content	Expected benefit
Practical evidence	Module-specific output rubric and facilitator observation checklist	Balances self-report with demonstrated application
Differentiation guidance	Beginner core, advanced extensions, prerequisite bridge and accessibility adaptations	Supports mixed groups without lowering ambition
Stakeholder cooperation menu	Lectures, visits, briefs, mentoring, internships, materials, jury roles and co-designed training with effort/benefit descriptions	Converts general interest into concrete participation
Transfer and localisation notes	Language-ready assets, equipment substitutions, regional examples and non-negotiable safety/learning elements	Enables responsible uptake across Central Europe
Evidence and versioning	Run log, response rates, participation unit, changes made, external reviews and version history	Supports continuous improvement and credible reporting

The final Toolkit should therefore present DiSTT not as a static collection of lesson plans but as a tested implementation system: modular programmes, practical delivery assets, an assessment backbone, stakeholder-engagement pathways and a documented improvement cycle. This approach reflects the strongest common evidence from LP1 and PP2–PP7 and provides a credible basis for wider regional adoption.