



COUNTRY REPORTS

Finland, Spain, and Portugal



D3.4 Country reports on MCs training provision in pilot countries

Deliverable D3.4 – Country Reports on MCs training provision in pilot countries consists of three country reports consolidated into this deliverable.

The country reports were prepared by the project partners – SAMIEDU, NAVARRA and ATEC - in accordance with the methodological guidance provided by FGB.



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Lists of abbreviations

ABBR	...	Description
ADAS	Advanced Driver Assistance Systems	ADAS – Advanced Driver Assistance Systems: Electronic systems that assist drivers with safety and driving tasks (e.g., lane-keeping, adaptive cruise control). Calibration refers to the precise alignment of sensors after repairs to ensure system accuracy.
AKL	Autoalan Keskusliitto; Finnish Central Organization for Motor Trade and Repairs	AKL – Finnish Central Organization for Motor Trade and Repairs: A key sectoral association representing automotive businesses in Finland, involved in policy dialogue, training standards, and industry development.
CVET	Continuing vocational education and training	Continuing Vocational Education and Training: Education and training activities aimed at adults and workers to update, deepen, or broaden their skills throughout their careers. CVET supports lifelong learning and adaptability to labor market changes.
ECTS	European Credit Transfer and Accumulation System	ECTS – European Credit Transfer and Accumulation System: A standard for measuring workload and learning outcomes in higher education, expressed in credits.
EDUFI	Finnish National Agency for Education (EDUFI)	Finnish National Agency for Education: The national authority responsible for education policy implementation, qualifications frameworks, curricula, and quality assurance in Finland.
EQF	European Qualifications Framework	EQF – European Qualifications Framework: An EU-wide framework for comparing qualifications across countries
EQF	European Qualifications Framework	An EU-wide reference framework that helps compare qualifications across different countries and systems. It ensures transparency and portability of learning outcomes.
ESF	European Social Fund	A major EU funding instrument that supports employment, education, and social inclusion projects. In Finland, ESR funds pilot projects for micro credentials and lifelong learning initiatives.
ESCO	European Skills, Competences, Qualifications and Occupations	ESCO – European Skills, Competences, Qualifications and Occupations: An EU classification system for skills and qualifications, used for interoperability and transparency in micro-credentials.
Europass	Europass	A European Union initiative providing standardized tools for documenting and sharing skills, qualifications, and learning

		outcomes. Europass supports transparency and portability of microcredentials across countries and systems.
HEI	Higher Education Institution	Universities and universities of applied sciences that provide degree programs and lifelong learning opportunities, including pilots for micro-credentials in Finland.
ICE	Internal Combustion Engine	ICE – Internal Combustion Engine: Traditional petrol or diesel engine technology. Competences include diagnostics, fuel system servicing, and mechanical maintenance, which remain relevant but are declining as EV adoption grows.
Jotpa	<i>Jatkuvan oppimisen ja työllisyyden palvelukeskus</i> (Continuous Learning and Employment Service Centre)	A Finnish national body that coordinates funding and development for continuous learning, including pilots for small competence units and micro-credentials.
NQF	National Qualifications Framework	NQF – National Qualifications Framework: Finland's framework for structuring qualifications.
MCs	Micro-credentials	Micro-credentials: Small, targeted learning units for upskilling and reskilling.
OEM	Original Equipment Manufacturer	OEM – Original Equipment Manufacturer: A company that produces parts or vehicles and provides brand-specific training, often required for compliance with manufacturer standards
RPL	Recognition of Prior Learning (RPL)	Recognition of Prior Learning: A process that allows individuals to have their existing skills, knowledge, and competencies -acquired through work experience, informal learning, or previous education- formally assessed and validated. In Finland, RPL enables learners to receive credit toward qualifications or micro-credentials without repeating learning, supporting flexibility and lifelong learning.
Tmi	Tmi short for <i>Toiminimi</i> (Sole Proprietorship)	Tmi – <i>Toiminimi</i> (Sole Proprietorship): The simplest form of business in Finland, owned and operated by one person who is personally liable for all obligations. Common among freelancers and small entrepreneurs due to easy setup and minimal administrative requirements.
VET	Vocational Education and Training	Vocational Education and Training: Education focused on practical skills for specific occupations.

1 FINLAND

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1.1 Executive summary

This report analyses Finland's emerging micro-credential (MC) ecosystem within vocational education and training (VET) and continuing VET (CVET), focusing on the automotive maintenance and repair sector under the green and digital transitions. Evidence from policy frameworks, employer surveys, European foresight studies, and stakeholder interviews confirms accelerating demand for high-voltage safety, battery diagnostics, ADAS calibration, and software-centric service processes, alongside transversal skills such as customer communication (CQ Systems, 2025; AUTOCOVE 2.0, 2024).

Finland's competence-based VET architecture provides a strong foundation for modular learning, but MCs are not yet formally embedded in the National Qualifications Framework (NQF). The Ministry of Education and Culture's draft framework for small competence units and the Digivisio 2030 initiative signal progress toward standardisation, quality assurance, and digital verifiability. Governance reforms, including the Continuous Learning Service Centre (JOTPA) and the 2024 pilot for operational steering of VET, aim to accelerate responsiveness through modular provision and AI-assisted skills anticipation (Ministry of Education and Culture, 2024; JOTPA, 2025).

Current provision remains dominated by full qualifications, while short courses—functionally equivalent to MCs—exist mainly for statutory safety training (e.g., SFS 6002) and OEM-specific modules. These offerings address urgent needs but lack formal recognition, portability, and consistent assessment standards. Systemic barriers persist: slow curriculum renewal, fragmented quality assurance, cost constraints for SMEs, and low awareness among learners and employers. Trust depends on externally validated, task-based assessment and issuance as European Digital Credentials with transparent metadata. Trust depends on externally moderated, task-based assessment and issuance as European Digital Credentials with transparent metadata.

Micro-credentials offer a credible pathway to bridge agility and legitimacy, provided they are quality-assured, digitally verifiable, and aligned with NQF/EQF frameworks. Policy priorities include establishing a national MC framework and register, embedding employer validation and skills-intelligence triggers into design, leveraging Digivisio 2030 for digital delivery, and introducing funding models linked to collective agreements to improve SME access. With these enablers, Finland can scale MCs to support the automotive sector's green and digital transition while promoting inclusive lifelong learning.

1.2 National policy and regulatory framework in Finland

Finland's vocational education and training (VET) system is built on a competence-based architecture that supports modular learning and lifelong adaptability. The cornerstone is the Act on Vocational Education and Training (531/2017), which consolidated youth and adult VET into a single outcomes-oriented system. This reform introduced modular qualification units, individualised learning paths, and recognition of prior learning (RPL), enabling learners to accumulate competences flexibly and shorten study time where prior skills are validated (Finlex, 2017; Ministry of Education and Culture, 2025). The Finnish National Qualifications Framework (NQF) is referenced to the European Qualifications Framework (EQF), ensuring transparency and portability of learning outcomes across borders. Quality assurance is coordinated through EQAVET principles, with working life committees validating competence demonstrations to maintain labour-market relevance (Opetushallitus, 2025c; OECD, 2025).

Strategic Drivers and Governance

Two major reforms shape Finland's approach to modular learning and micro-credentials. The Continuous Learning Reform established the Service Centre for Continuous Learning and Employment (JOTPA), which funds short,

targeted training for adults and coordinates skills anticipation through the Osaamistarvekompassi (Skills Needs Compass). This tool uses AI-assisted analytics to aggregate labour-market signals—such as job postings and investment trends—into annually refreshed competence clusters, providing evidence for curriculum renewal and modular provision (JOTPA, 2025; OECD, 2025).

Finland's legally binding carbon neutrality target for 2035 accelerates electrification and clean-tech adoption, while digitalisation reshapes workshop tasks toward diagnostics, software updates, and ADAS calibration. These dynamics create systemic pressure for agile learning solutions that can respond faster than traditional curriculum cycles (Ministry of Economic Affairs and Employment, 2022; Climate Change Act, 2022). At the same time, demographic trends and regional disparities require inclusive pathways for SMEs and adult learners, reinforcing the need for short, portable learning units (OECD, 2025).

Policy Instruments and Digital Infrastructure

To address these challenges, the Ministry of Education and Culture has published a draft national framework for small competence units, which sets design principles, quality assurance criteria, and requirements for digital verifiability. The framework emphasises interoperability with Europass and the European Digital Credentials (EDC) infrastructure, embedding metadata such as learning outcomes, workload, level descriptors, and ESCO skill tags to ensure machine-readable portability (Ministry of Education and Culture, 2024; European Commission, 2025). The Digivisio 2030 initiative provides the digital backbone for credential issuance and learner-controlled storage, supporting transparency and trust in micro-credentials.

Governance Tension: Agility vs Legitimacy

Despite these enablers, a structural tension persists. Industry-led short courses—such as SFS 6002 electrical safety training—are agile and trusted in practice but often remain outside formal qualification frameworks, limiting portability and oversight. Conversely, regulated VET pathways confer legitimacy and equity but refresh content slowly, creating a lag between technological change and curriculum updates. The EU Council Recommendation on Micro-credentials (2022) offers a reference point for reconciling this tension through clearly specified learning outcomes, validated assessments, and standardised digital credential formats. Embedding these principles in Finnish practice would allow micro-credentials to function as institutional bridges rather than ad hoc solutions, enabling rapid upskilling while safeguarding quality assurance and learner rights (Council of the European Union, 2022; Opetushallitus, 2025c).

1.2.1 Definitions, Framework and Quality Assurance

Finland does not yet have a legally binding definition of micro-credentials. However, the concept is embedded in practice through the modular structure of the national qualifications system. The Act on Vocational Education and Training (531/2017) introduced competence-based qualification units, which allow learners to accumulate skills progressively and flexibly. These units are described in terms of learning outcomes and assessed through competence demonstrations, aligning with European principles for transparency and portability (Finlex, 2017; Council of the European Union, 2022; OECD, 2025).

The Finnish National Qualifications Framework (NQF) is aligned with the European Qualifications Framework (EQF), ensuring comparability of learning outcomes across Europe. While micro-credentials smaller than a qualification unit are not yet formally anchored in the NQF, the Ministry of Education and Culture has published a draft framework for small competence units. This draft sets design principles, quality assurance criteria, and requirements for digital verifiability, emphasising interoperability with European tools such as Europass and the

European Digital Credentials (EDC) infrastructure. These tools enable secure, machine-readable certificates with embedded metadata, including ESCO skill tags and EQF level descriptors (Ministry of Education and Culture, 2024; Opetushallitus, 2025c; European Commission, 2023).

Quality assurance remains a cornerstone of Finnish education policy. Accredited VET providers must comply with national standards, and micro-credentials delivered within this system are subject to the same rigorous oversight as full qualifications. The Finnish National Agency for Education (EDUFI) coordinates quality assurance through national reference points and participates in the European Quality Assurance in Vocational Education and Training (EQAVET) network (Opetushallitus, 2025a). Working life committees contribute to quality by validating competence demonstrations and ensuring alignment with labour-market needs, although recent evaluations highlight variability in employer involvement across sectors (FINEEC, 2024; OECD, 2025). For micro-credentials, the draft framework proposes mandatory criteria for learning outcomes, assessment methods, and digital credentialing, aiming to strengthen trust and portability in both national and international contexts.

Organising vocational education in Finland requires an authorisation granted by the Ministry of Education and Culture, which specifies the qualifications that the provider is entitled to award and for which it can organise qualification-based training. As part of recent reforms, the Act on the Pilot for Operational Steering of Vocational Education (1077/2024) applies to selected providers. This pilot grants broader rights to organise various vocational qualifications and qualification units, enabling more flexible responses to emerging skills needs. Samiedu Vocational College participates in this pilot, which supports innovation in modular learning and micro-credential development (Finlex, 2024).

1.2.2 Recognition of Prior Learning and European Alignment

Recognition of Prior Learning (RPL) is a well-established feature of Finland's vocational education and training (VET) system and plays a central role in supporting lifelong learning. Under the Act on Vocational Education and Training (531/2017), learners can demonstrate competencies acquired through work experience, informal learning, or previous studies and have these validated against the learning outcomes of qualification units. This process enables individuals to shorten study time and avoid duplication of learning, which is particularly valuable for adults and workers in transition. RPL is therefore a natural complement to micro-credentials, as both approaches aim to increase flexibility and responsiveness in skills development (Finlex, 2017; OECD, 2025).

The Finnish system primarily assesses prior learning against outcomes defined in national qualification requirements, which are aligned with the National Qualifications Framework (NQF) and the European Qualifications Framework (EQF). This alignment ensures transparency and comparability across Europe, supporting portability of skills and qualifications (Council of the European Union, 2022; Opetushallitus, 2025c). While RPL is widely used at the level of full qualifications and qualification units, the draft national framework for small competence units published by the Ministry of Education and Culture in 2024 signals an intention to extend recognition practices to micro-credentials. The draft proposes that validated prior learning could be formally documented as a micro-credential, provided it meets defined quality criteria and is issued through secure digital systems such as Europass and the European Digital Credentials (EDC) infrastructure (Ministry of Education and Culture, 2024; European Commission, 2023).

Recognition and validation of prior learning is the responsibility of the education provider and is carried out as part of the student's Personal Competence Development Plan (PCDP). Each learner starting their studies receives a PCDP, which records details related to recognition, validation, acquisition, development, and demonstration of

competence, as well as guidance and support measures. Based on the learner's goals and identified prior learning, the provider determines whether the learner will complete the full qualification, a qualification unit, or parts of it. Information on recognised competence is recorded in the qualification certificate (Finlex, 2017).

Despite these strengths, data on RPL uptake in Finland remain limited. Evaluations indicate that participation varies by sector and learner group, and awareness among employers and individuals is uneven (FINEEC, 2024; OECD, 2025). Furthermore, the assessment of prior learning is resource-intensive, requiring robust procedures and qualified assessors to ensure reliability and fairness. Extending these practices to micro-credentials will therefore necessitate clear standards, streamlined processes, and digital tools to reduce administrative burden while maintaining trust.

Finland's approach aligns closely with the EU Council Recommendation on Micro-credentials (2022), which emphasises transparency, portability, and quality assurance. Cedefop (2022; 2024) and Brauer (2023) highlight Finland as an active participant in European efforts to map and integrate micro-credentials into VET systems. These studies note that Finnish practice already reflects many of the principles outlined in the Recommendation, even without a formal legal definition of micro-credentials.

National initiatives further reinforce this alignment. The Finnish National Agency for Education (EDUFI, 2025) reports on pilots introducing adult basic skills badges and frameworks for small competence units. These pilots aim to improve accessibility and recognition of learning outcomes, ensuring that micro-credentials and RPL work together to create bridges within the lifelong learning ecosystem. Skills badges are derived from the learning objectives in qualification requirements, allowing them to be linked to assessment criteria and competence acquisition within a qualification component.

1.2.3 Governance and Institutional Roles

The governance of micro-credentials in Finland reflects a multi-level, consensus-based structure that combines national steering with sectoral and institutional autonomy. At the national level, the Ministry of Education and Culture provides strategic direction and legislative frameworks, including the Act on Vocational Education and Training (531/2017), which underpins competence-based and modular learning pathways (Finlex, 2017; Ministry of Education and Culture, 2025). The Finnish National Agency for Education (EDUFI) operationalises these policies through qualification requirements, quality assurance mechanisms, and guidance on recognition tools such as Europass and the European Digital Credentials infrastructure (Opetushallitus, 2025c; European Commission, 2023). EDUFI also acts as the national reference point for EQAVET, ensuring alignment with European quality standards.

Recent reforms have strengthened the role of the Service Centre for Continuous Learning and Employment (JOTPA), established in 2021 to bridge labour market needs and skills supply. JOTPA coordinates skills anticipation activities and funds short, targeted training for adults, including pilots for small competence units that function as micro-credentials. Its Osaamistarvekompassi tool aggregates real-time labour market signals using AI-based analytics, supporting evidence-based curriculum renewal and modular provision (JOTPA, 2025; OECD, 2025). This marks a shift from the previous Osaamisen ennakointifoorumi (OEF) model toward a more integrated, continuous learning approach.

Governance in vocational education is characterised by strong tripartite collaboration. Employers, trade unions, and sectoral bodies such as Autoalan Keskusliitto (AKL) participate in working life committees that validate competence demonstrations and influence qualification content. However, evaluations by the Finnish Education Evaluation

Centre (FINEEC, 2024) and OECD (2025) indicate variability in employer involvement across sectors, with emerging fields such as electric mobility requiring more systematic engagement. Collective agreements in the automotive sector also shape training investment, although detailed provisions on training rights and co-investment mechanisms remain fragmented and require clarification (Autoalan keskusliitto, 2025).

Despite these strengths, governance faces a structural tension between agility and legitimacy. Industry-driven training, such as SFS 6002 electrical safety modules, responds rapidly to technological change but operates outside formal qualification frameworks, limiting portability and oversight. Conversely, the regulated VET system ensures equity and quality but struggles to update curricula at the pace of innovation. Micro-credentials are therefore not merely technical artefacts but potential governance instruments to reconcile responsiveness with regulated standards. Achieving this balance will require clear rules for quality assurance, external moderation of assessments, and digital infrastructure for verifiable credentialing, alongside mechanisms for employer co-design and funding participation (Council of the European Union, 2022; Ministry of Education and Culture, 2024).

1.2.4 Funding, Infrastructures, and Collective Agreements

Funding arrangements play a decisive role in shaping the feasibility and scalability of micro-credentials in Finland. Vocational education and training (VET) is primarily financed through public funding under the Act on Vocational Education and Training (531/2017), which guarantees free access to initial qualifications and competence-based units for learners (Finlex, 2017; Ministry of Education and Culture, 2025). The funding model combines core financing with performance-based components linked to completion rates and employment outcomes, incentivising providers to maintain quality and responsiveness (OECD, 2025). However, smaller learning units and short courses—functionally equivalent to micro-credentials—are often delivered as continuing education and subject to fees, creating cost barriers for individuals and small and medium-sized enterprises (SMEs) (Autoalan keskusliitto, 2025).

To address these gaps, Finland has introduced targeted instruments through the Continuous Learning Reform. The Service Centre for Continuous Learning and Employment (JOTPA) allocates competitive grants for short, modular training aligned with labour market needs, including pilots for micro-credentials in vocational and higher education contexts (JOTPA, 2025). These initiatives aim to improve accessibility for adults in work or transition, but reliance on project-based funding limits long-term sustainability and scale-up. OECD (2025) notes that the absence of permanent funding streams for micro-credentials remains a structural barrier to system integration.

Digital infrastructures are another critical enabler. The Digivisio 2030 initiative provides the backbone for interoperable credentialing systems, enabling secure issuance and storage of digital certificates through platforms such as Opin.fi. Integration with European tools—Europass and the European Digital Credentials infrastructure—ensures portability and machine-readability, supporting transparency and trust (European Commission, 2023; Opetushallitus, 2025c). Despite these advances, the lack of a national register for micro-credentials and inconsistent metadata standards hinder verifiability and comparability, particularly in safety-critical domains such as automotive electrification.

Collective agreements in Finland's coordinated labour market further influence training investment. Sectoral agreements negotiated by employer organisations and trade unions, including Autoalan Keskusliitto (AKL), often include provisions for professional development and training rights. However, detailed entitlements—such as the number of training days or co-investment mechanisms—are not systematically published and require clarification with social partners (Autoalan keskusliitto, 2025). Evidence from OECD (2025) and FINEEC (2024) suggests that

while employers recognise the importance of upskilling, participation in curriculum design and funding decisions varies significantly across sectors, with emerging technology fields facing the greatest challenges.

In sum, Finland's funding and infrastructure landscape provides a strong foundation for micro-credential development but remains fragmented. Sustainable integration will require permanent funding models, sectoral co-investment strategies, and robust digital architectures for credential verification. These measures are essential to ensure that micro-credentials function not as isolated innovations but as systemic tools for lifelong learning and labour market adaptability.

1.2.5 Gaps and barriers

Despite Finland's strong foundation for lifelong learning and modularisation, several systemic barriers hinder the full integration of micro-credentials into the education and training ecosystem. The most significant gap is the absence of a legally binding definition and regulatory framework for micro-credentials. While the Ministry of Education and Culture's draft framework for small competence units signals progress, its non-binding status creates uncertainty for providers and employers, resulting in fragmented implementation and uneven uptake (Ministry of Education and Culture, 2024; OECD, 2025). Current reforms of qualification requirements aim to increase flexibility by enabling smaller units and expanding opportunities for combining modules across qualifications, but these changes remain gradual and resource-intensive (Opetushallitus, 2025a).

Digital infrastructure development represents another critical barrier. Although initiatives such as Digivisio 2030 and the European Digital Credentials infrastructure are advancing, interoperability between systems is not yet fully achieved. The absence of a national register for micro-credentials and inconsistent metadata standards limit transparency, comparability, and portability, particularly for safety-critical competences in the automotive sector (European Commission, 2023; Opetushallitus, 2025c). Without robust digital architectures, micro-credentials risk remaining isolated innovations rather than integrated components of lifelong learning pathways.

Awareness and understanding among learners and employers also remain limited. Evidence from interviews and sectoral studies indicates that SMEs often lack familiarity with micro-credentials and their potential value for recruitment and career progression (Autoalan keskusliitto, 2025; OECD, 2025). This low visibility is compounded by the absence of standardised information platforms, making it difficult for individuals and companies to identify relevant offerings. Furthermore, socio-economic barriers—such as cost, time constraints, and family responsibilities—restrict participation in upskilling, reinforcing disparities in lifelong learning engagement (FINEEC, 2024).

Finally, governance and quality assurance challenges persist. Industry-driven training, such as SFS 6002 electrical safety modules, responds rapidly to technological change but operates outside formal qualification frameworks, limiting portability and oversight. Conversely, the regulated VET system ensures legitimacy and equity but struggles to update curricula at the pace required by electrification and digitalisation. This tension between agility and legitimacy underscores the need for micro-credentials to function as governance instruments rather than ad hoc solutions. Achieving this will require clear standards for learning outcomes, externally validated assessment, and mechanisms for stackability and recognition of prior learning (Council of the European Union, 2022; OECD, 2025).

1.3 Key Stakeholders and Cooperation Ecosystem

The cooperation ecosystem for micro-credentials in Finland's automotive maintenance and repair sector is defined by tripartite governance, sectoral intermediaries and multi-provider delivery. National authorities set the legislative and strategic parameters for competence-based VET and quality assurance, while EDUFI operationalises qualifications and European alignment, and JOTPA coordinates near-term skills anticipation and funds modular training for adults. Sector bodies—most notably Autoalan Keskusliitto (AKL)—mediate employer viewpoints, contribute to safety culture and advise workshops, with SFS 6002:2025 providing detailed electrical safety requirements for high-voltage vehicles and documenting expectations for training evidence and risk-managed practice (Autoalan keskusliitto, 2025; SESKO, 2025). Providers occupy distinct roles: public VET institutions deliver the foundational competence base; OEM academies and private trainers maintain fast update cycles for brand-specific diagnostics and ADAS calibration; and higher education units pilot micro-credential models in continuous learning contexts (OECD, 2025; AUTOCOVE 2.0, 2024).

A scientific analysis of stakeholder dynamics must explicitly address the agility–legitimacy tension that emerges when industry-led short courses and certifications operate outside formal frameworks. In safety-critical domains, rapid deployment of training aligned to evolving standards is essential; however, without externally moderated assessments, standardised metadata and digital verifiability, portability and public oversight remain limited. Conversely, regulated VET pathways confer legitimacy and equity but are slower to renew content at the pace of electrification and software-centric diagnostics. Within this ecosystem, the automotive mechanic should be recognised as a safety-critical professional actor at the boundary between regulation, OEM systems and customer trust. Micro-credentials should therefore be conceived as professional guarantees—verifiable licences to practise risk-bearing tasks such as high-voltage isolation and live work—while certifying advanced diagnostic and customer-facing competences that underpin service quality and roadworthiness (SESKO, 2025; OECD, 2025). The subsequent sub-sections examine actor roles, cooperation modalities and deficiencies; they then propose fit-for-purpose assessment designs, governed stackability, and digital architectures that operationalise micro-credentials as institutional bridges rather than isolated technical artefacts (Council of the European Union, 2022; European Commission, 2025).

The key actors in are also listed in Annex 3.3.

1.3.1 Conceptual Understanding and Actor Roles

Micro-credentials in Finland's automotive maintenance and repair sector operate within a governance architecture that couples national steering with sectoral co-production and institutional autonomy. At the system level, the Ministry of Education and Culture (OKM) sets the legislative and strategic framework for competence-based vocational education and training (VET), notably through the Act on Vocational Education and Training (531/2017), which enables modular learning, recognition of prior learning and individually tailored progression through qualification units (Finlex, 2017; Ministry of Education and Culture, 2025). The Finnish National Agency for Education (EDUFI) translates these rules into operational guidance by defining qualification requirements, coordinating national quality assurance arrangements and supporting European alignment via Europass and the European Digital Credentials infrastructure, which together provide tamper-evident, machine-readable credential formats and learner wallets to enhance portability and trust (Opetushallitus, 2025c; European Commission, 2025).

Near-term skills anticipation has been strengthened by the Service Centre for Continuous Learning and Employment (JOTPA), which consolidates labour-market signals and funds short, modular training for working-age

adults. JOTPA's Osaamistarvekompassi integrates vacancy data, investment information and other sources using AI-assisted analytics to generate annually refreshed insights on emerging competence needs designed to inform providers' decisions about modular provision and micro-credential design (JOTPA, 2025; JOTPA/Osaamistarvekompassi, 2025). This marks a structural shift from the earlier Osaamisen ennakointifoorumi model towards a continuous learning approach that explicitly serves rapid curriculum renewal and targeted upskilling, consistent with the OECD's emphasis on agile VET updates under the green transition (Opetushallitus, 2025; OECD, 2025).

Within the automotive ecosystem, intermediary organisations and social partners play decisive roles in legitimising safety-critical competences and shaping training pathways. Autoalan Keskusliitto (AKL), as the central employer body, participates in sectoral dialogue, supports member workshops and contributes to the institutionalisation of safety culture with standards bodies (Autoalan keskusliitto, 2025). The national electrical safety standard SFS 6002:2025—coordinated by SESKO's SK 78 committee and updated in 2025—provides detailed guidance for high-voltage vehicle work, including revised annexes on direct-current hazards (T), electric vehicles (U) and training/organisation (X), clarifying competence and documentation expectations in high-risk contexts (SESKO, 2025; SFS, 2025). Providers deliver the foundational competence profile defined in national qualification requirements, while OEM academies and private training companies maintain faster cycles for brand-specific diagnostics, access-rights procedures and advanced calibration tasks that evolve rapidly with electrification and software densification (AUTOCOVE 2.0, 2024; OECD, 2025).

A central conceptual issue is the tension between agility and legitimacy. Industry-driven short courses and certifications—such as those aligned to SFS 6002—are agile and responsive to technological change; they translate new standards and OEM procedures into operational training with minimal delay and enjoy practical trust among employers. However, they often sit outside the formal qualification architecture, which reduces portability, comparability and public oversight. Conversely, the regulated VET system confers legitimacy, equity and audited quality, but its revision cycles are slower and can lag behind rapid developments in EV systems, diagnostics and software-centric service processes (OECD, 2025; FINEEC, 2025). From a governance perspective, micro-credentials should therefore be treated not as neutral technical artefacts but as institutional instruments designed to bridge this tension. Their value depends on the adoption of externally validated assessment regimes, transparent metadata practices and, where feasible, referencing to the NQF/EQF so that responsiveness does not compromise regulated quality and portability (Council of the European Union, 2022; European Commission, 2025).

The role of the automotive mechanic warrants explicit reframing. Rather than being a passive recipient of training, the mechanic is a safety-critical professional actor situated at the boundary between regulation, OEM digital ecosystems and customer trust. In an electrifying aftermarket, the mechanic's competence in high-voltage isolation, adherence to live-work protocols, secure diagnostic practices and ADAS calibration has direct implications for occupational safety and roadworthiness. Treating micro-credentials as professional guarantees—verifiable licences to practise defined risk-bearing tasks—aligns with Finland's safety culture and strengthens public and employer confidence in discrete competence claims (SESKO, 2025; OECD, 2025). At the same time, sector interviews and provider practices indicate that the three-year initial VET programmes must continue to prioritise foundational skills (chassis, brakes, basic electrics, routine maintenance) and work-readiness dispositions, because little of this core has disappeared with electrification; advanced EV/HV specialisation is realistically acquired post-graduation through stackable micro-credentials and workplace experience, a view consistent with employer expectations that entry-level graduates bring sound basics and a demonstrable capacity to learn rather than deep EV expertise (OECD, 2025; Autoalan keskusliitto, 2025).

Finally, actor roles must be read in the context of European portability and digital architectures. The deployment of European Digital Credentials for issuance and learner wallets, combined with ESCO-based skill tagging and NQF/EQF referencing where appropriate, can render industry-aligned micro-credentials interoperable and comparable across providers and regions. This approach allows agile modules to be audited and recognised without sacrificing the regulated quality assurance principles embedded in the Finnish VET system (Council of the European Union, 2022; European Commission, 2025). Conceptually, micro-credentials thereby become the institutional mechanism that connects rapid sectoral innovation to transparent, portable competence guarantees, provided that the governance conditions identified above are met.

1.3.2 Cooperation Models, Governance, and Deficiencies

The cooperation architecture that enables micro-credentials in Finland's automotive maintenance and repair sector is most visible at the regional level, where vocational providers, municipal development companies, employer networks and public authorities interact to translate national steering into practice. In South Savo, two upper-secondary VET institutions—Samiedu in Savonlinna and Esedu in Mikkeli and Pieksämäki—function as anchor organisations. Samiedu operates as a multi-field college within a municipal federation and has a long track record of pedagogical development and short, work-oriented courses, including safety certificates, that complement qualification-based learning; Esedu likewise combines initial qualifications with further and specialist qualifications, apprenticeship pathways and short targeted trainings for firms, including electrical-work safety and other statutory certificates (Samiedu, 2025; Esedu, 2025). These providers mediate between national qualification requirements and local workshop needs, adjusting delivery modes and assessment contexts through workplace learning and continuous admission processes that allow modules to start throughout the year (Samiedu, 2025; Esedu, 2025).

Regional development authorities structure cooperation around funding, anticipation and spatial planning. The South Savo Regional Council prepares the regional strategy, programme and land-use plan in collaboration with municipalities, the South Savo ELY Centre, education providers and enterprises; this framework guides the allocation of EU structural funds and identifies priorities—such as smart specialisation and digital accessibility—that shape skills projects and training demand (South Savo Regional Council, 2025). The ELY Centre performs state regional administrative tasks and, in Eastern Finland, acts as a funding authority for ERDF/ESF+ and Just Transition Fund measures; at the same time it convenes employers and educational institutions around labour-market services and training instruments, thereby linking company investment pipelines to tailored upskilling offers (ELY Centre South Savo, 2025). In parallel, municipal development companies coordinate investment promotion and project pipelines that depend on ERDF and regional co-financing, reinforcing the demand signal for specific competences, including electrification and battery technologies (MikseiMikkeli, 2025; South Savo Regional Council, 2025).

Near-term skills intelligence has been consolidated through the Service Centre for Continuous Learning and Employment (JOTPA). Its Osaamistarvekompassi integrates large datasets—including recent job postings and sector signals—using AI-assisted analytics to generate annually refreshed insights on emerging competence needs. These outputs are designed to inform providers' decisions about modular provision and the development of short, targeted training for working-age adults (JOTPA, 2025; OECD, 2025). This marks a structural shift from the earlier Osaamisen ennakointifoorumi (OEF) towards a more integrated anticipation function that explicitly serves continuous learning and rapid curriculum renewal (Opetushallitus, 2025; JOTPA, 2025).

These cooperation models make the agility–legitimacy tension concrete at the meso level. Providers and employers value fast, practice-near modules for evolving tasks, but portability and public oversight require integration with

regulated quality assurance and transparent credentialing. The 2025 update of SFS 6002 codifies EV-related risks and training expectations through revised annexes—U for electric vehicles, T for direct-current hazards, and X for training and organisation—clarifying what competence evidence ought to contain in safety-critical contexts. However, local delivery still varies in assessment methods, moderation and documentation, and employers cannot always rely on uniform evidence across providers (SESKO, 2025; SFS, 2025). This variability echoes national evaluations that find uneven employer involvement and inconsistent translation of sector signals into auditable assessment tasks, especially in rapidly changing technology fields (FINEEC, 2025; OECD, 2025).

A region-level resolution is technically feasible but requires deliberate design. First, assessment must be treated as a design variable rather than an administrative afterthought. For micro-credentials that certify safety-critical competences, task-based practical assessments aligned with SFS 6002 risk categories should be externally moderated on a sampling basis by panels convened with sector bodies and public authorities to ensure comparability across providers. Second, digital verifiability should be institutionalised: issuing micro-credentials as European Digital Credentials with embedded ESCO-based descriptors and workload/level metadata would make locally delivered modules portable to other regions and Member States, while enabling immediate authenticity checking in employer workflows (European Commission, 2025). Finally, regional authorities and ELY Centres can tie funding and procurement of short courses to this assessment and credentialing conditions, thereby using ERDF/ESF+ and JOTPA instruments to align agility with legitimacy in the regional ecosystem (OECD, 2025).

In substantive terms, the South Savo case illustrates how cooperation can support both foundational and advanced learning pathways. Initial VET continues to prioritise core competencies such as chassis, brakes, basic electrics and routine maintenance, while advanced EV/HV specialisation is realistically achieved through stackable micro-credentials taken post-graduation and in work, including SFS-aligned electrical safety and, for experienced personnel, live-work authorisations. Regionally, apprenticeship and continuous-admission models provide the scheduling flexibility SMEs require, and development agencies' investment promotion work helps create demand for upskilling in electrification niches. Yet without externally moderated assessment and digitally verifiable micro-credentials, these local strengths cannot fully address employers' needs for portable, trusted evidence or support cross-provider mobility in a fragmented training market (Esedu, 2025; OECD, 2025).

Overall, the regional ecosystem is not a peripheral detail but the operational layer where micro-credentials either become institutional bridges between responsiveness and regulated quality, or remain isolated offerings. Embedding moderated, task-based assessment; adopting European Digital Credentials with consistent metadata; and aligning regional funding with these requirements would allow VET providers, ELY Centres and the Regional Council to convert cooperation into system-level portability and trust, while retaining the agility that local firms demand. This approach is consistent with European guidance on micro-credentials and digital credentialing and with OECD's diagnosis that Finnish VET's contribution to the green transition depends on faster content renewal without sacrificing quality assurance and comparability (Council of the European Union, 2022; OECD, 2025).

1.3.3 Key Challenges and Fragmentation

The fragmentation observed in Finland's automotive maintenance and repair skills ecosystem is best understood as a structural condition rather than a series of isolated deficiencies. Multiple provider types—public VET institutions, higher education units engaged in continuous learning, OEM academies and private trainers—operate with heterogeneous assessment practices, metadata conventions and update cycles. While such plurality affords agility in fast-moving technical domains, it also generates coordination failures that limit portability, comparability and system-level quality assurance. National evaluations and international reviews converge on the finding that

employer participation and working-life committee engagement vary notably across sectors, with the most rapid technological changes occurring precisely where governance capacity is thinnest (FINEEC, 2025; OECD, 2025). In the automotive case, this manifests as uneven translation of skills intelligence into auditable learning outcomes and externally validated assessments, particularly for emerging tasks in electrification, diagnostics and ADAS calibration (OECD, 2025; JOTPA, 2025).

Assessment constitutes the system's Achilles heel. Provider-generated multiple-choice tests and locally defined practical demonstrations remain common for short courses, yet they seldom meet the evidentiary standards required for portability in safety-critical domains. The 2025 revision of SFS 6002 clarifies competence expectations for high-voltage work, including annexed guidance on direct-current hazards (T), electric vehicles (U) and organisational responsibilities (X), but the existence of a standard does not, by itself, ensure assessment comparability across providers (SESKO, 2025; SFS, 2025). Absent external moderation and shared task specifications aligned to the risk categories of SFS 6002, micro-credentials risk becoming locality-bound tokens of attendance rather than verifiable licences to practise. This undermines employer trust, weakens learner mobility and constrains the public legitimacy that micro-credentials require to function as institutional bridges between agile provision and regulated VET pathways (OECD, 2025; FINEEC, 2025).

Stackability problems compound these assessment weaknesses. In the absence of governed progression, learners may accumulate short courses that bypass foundational competences or conflate exposure with capability. The Council Recommendation on micro-credentials emphasises clearly specified learning outcomes, reliable assessment and transparent workload and level descriptors as preconditions for recognition across contexts; applying these principles in the Finnish automotive context implies defining gateways from EV/HV safety to supervised practice and ultimately to live-work authorisation, with recognition of prior learning permitted only where workplace evidence and moderated assessment demonstrate equivalence (Council of the European Union, 2022; OECD, 2025). Without such design, stackability devolves into mere aggregation and re-introduces exactly the legitimacy deficits that the competence-based VET architecture sought to remedy (Finlex, 2017; Opetushallitus, 2025c).

Digital infrastructure remains under-utilised as a policy lever. Although the European Digital Credentials infrastructure provides a tamper-evident, machine-readable format with embedded metadata and seamless verification in learner wallets, adoption is inconsistent, and sector-wide choices on credential registries, ESCO tagging and verification workflows are not yet embedded in routine practice (European Commission, 2025; Opetushallitus, 2025c). The consequence is predictable: even high-quality local provision cannot guarantee recognisability beyond the issuing provider, and employers must rely on informal signals rather than verifiable credential data. In safety-critical areas, the opportunity cost of this gap is high, as the absence of uniform digital verifiability weakens both compliance assurance and insurance-related risk management (SESKO, 2025; OECD, 2025).

Finally, coordination failures persist at the interface between skills intelligence and programme renewal. JOTPA's Osaamistarvekompassi produces annually refreshed, AI-assisted signals about emerging competence clusters, but decision rights and refresh triggers at provider level are not yet systematically coupled to these outputs. Where employer involvement is uneven and assessment models lack external moderation, the translation from intelligence to credential design remains slow or idiosyncratic (JOTPA, 2025; OECD, 2025). This is not a problem that can be solved by additional diagnosis; it requires institutional design choices that align funding, assessment, and digital issuance with a governed progression model. As established in Chapter 2, Finland already possesses the enabling legal and strategic instruments for competence-based and modular learning; the binding constraint is the absence

of a common architecture that makes micro-credentials simultaneously responsive and recognisable. The policy priority is therefore coordination: embed moderated, task-based assessment aligned to SFS 6002, enforce digital issuance as European Digital Credentials with ESCO-based descriptors, and audit stackability against defined gateways so that micro-credentials operate as professional guarantees rather than certificates of attendance (SESKO, 2025; Council of the European Union, 2022).

Taken together, the evidence indicates that the binding constraint is not a lack of pilots but the absence of a common architecture that renders micro-credentials both responsive and recognisable. In safety-critical domains, resolving the agility–legitimacy tension requires externally moderated, task-based assessments aligned with SFS 6002 risk categories, systematic digital issuance as European Digital Credentials with transparent descriptors, and governed progression that protects foundational competences while enabling RPL under auditable conditions (SESKO, 2025; SFS, 2025; Council of the European Union, 2022; European Commission, 2025). At regional level, coupling JOTPA’s skills-intelligence triggers to providers’ refresh cycles and to funding conditions would convert meso-level cooperation into portable, trusted evidence for employers (JOTPA, 2025; OECD, 2025). Chapters 4 and 5 operationalise these requirements in provision and assessment design and in the deployment of skills intelligence, while Chapter 7 sequences the necessary policy choices and experiment designs so that micro-credentials function as professional guarantees rather than certificates of attendance (FINEEC, 2025; OECD, 2025).

1.4 MC offerings and learning pathways

This chapter examines how micro-credentials in Finland’s automotive maintenance and repair sector should be designed, assessed and embedded to function as institutional instruments rather than ad hoc short courses. The analysis proceeds from the governance dilemma established earlier—the tension between agility and legitimacy—and operationalises it through four interlocking design choices: (i) the positioning of micro-credentials as advanced, stackable specialisations that complement foundational VET competences; (ii) a fit-for-purpose assessment model that replaces provider-generated multiple-choice tests with task-based practicals aligned to risk categories and supported by external moderation; (iii) digital verifiability via European Digital Credentials with transparent descriptors and, where feasible, NQF/EQF referencing to secure portability and trust; and (iv) governed progression, in which stackability protects minimum thresholds and integrates recognition of prior learning only under auditable conditions (OECD, 2025; Council of the European Union, 2022; European Commission, 2025; Opetushallitus, 2025c).

In safety-critical domains, notably high-voltage work on electric and hybrid vehicles, the 2025 revision of SFS 6002 clarifies competence expectations and organisational responsibilities through updated annexes on direct-current hazards (T), electric vehicles (U) and training/organisation (X). These technical specifications, however, realise their public value only when translated into assessment comparability across providers and regions. Consequently, this chapter specifies gateway-linked assessment requirements—from foundational electrical safety competence to high-voltage maintenance, EV/hybrid electrical work and, for experienced personnel, live-work authorisation—and details moderation and evidence standards that turn micro-credentials into verifiable licences to practise rather than certificates of attendance (SESKO, 2025; SFS, 2025; OECD, 2025).

The chapter further addresses regional delivery realities—including the role of providers such as Samiedu and Esedu—and couples programme design to skills-intelligence triggers generated by JOTPA’s Osaamistarvekompassi. By linking refresh cycles and funding conditions to these triggers, regional ecosystems can update offerings for diagnostics, ADAS calibration and battery refurbishment while preserving a common

architecture for assessment and digital issuance. This converts local agility into system-level portability and trust for employers and learners, and aligns micro-credential provision with Finland’s competence-based VET framework and European portability instruments (JOTPA, 2025; Finlex, 2017; OECD, 2025; European Commission, 2025).

The remainder of Chapter 4 is structured as follows: Section 4.1 defines the learning pathway and positions micro-credentials relative to foundational VET; Section 4.2 sets out the fit-for-purpose assessment model (task-based practicals, external moderation, digital evidence); Section 4.3 specifies digital credentialing and metadata requirements for portability and verification; and Section 4.4 formalises governed stackability and the integration of recognition of prior learning within gateway rules (Council of the European Union, 2022; European Commission, 2025; Opetushallitus, 2025c; OECD, 2025).

1.4.1 Mapped Skill Modules and Learning Pathway Structure

Table 1 summarises the current short-course landscape in the automotive maintenance and repair sector, including SFS-aligned electrical safety training, high-voltage maintenance, EV/hybrid electrical work, and live-work training, with attributes for provider type, delivery mode, target group, workload and entry requirements. These modules were retained in the mapping because, unlike many short courses, they already specify learning outcomes and contain at least rudimentary assessment elements, which makes them the closest candidates for conversion into recognisable micro-credentials (OECD, 2025; Autoalan keskusliitto, 2025). At the same time, the entries in Table 1 also reveal systemic constraints: assessment practices remain heterogeneous across providers, stackability rules are not explicit, and digital verifiability is rarely implemented, which collectively limits portability and employer trust (OECD, 2025; Opetushallitus, 2025c).

Table 1. Details concerning the skill modules of Automotive SF6002 electrical safety training and live work training.

Skill Module	Automotive SFS6002 electrical safety training	Live work training
Skill domain	Green	Green
Competency level	Foundation	Expert
Provider Type	Formal / Non-Formal / OEM	Non-Formal / OEM
MC Format	Certificate of Completion	Certificate of Completion
Delivery Mode	In-class / Online / Hybrid	In-class / Hands-on
Target Group	All personnel working with HV-vehicles	EV-mechanics working with high-voltage batteries
Duration	1 – 2 days	1 – 2 days
Entry requirements	None	Automotive SFS6002 electrical safety training and work experience with HV-vehicles

The offerings listed in Table 1 should therefore be repositioned as advanced, stackable specialisations that complement the foundational competence profile delivered in initial VET. Sector interviews and provider experience

indicate that three-year upper-secondary programmes must continue to prioritise chassis, brakes, routine maintenance and basic electrics, while deeper high-voltage and software-centred competence is realistically acquired post-graduation and in work (OECD, 2025; Autoalan keskusliitto, 2025). Within this architecture, micro-credentials are not neutral short courses but institutional instruments that reconcile the sector's need for agility—rapid translation of new requirements into training—with the system's need for legitimacy—equity, quality assurance and portability (OECD, 2025; Council of the European Union, 2022).

The pathway implied by Table 1 can be formalised as governed progression rather than accumulation. A first gateway is foundational electrical safety competence aligned to SFS 6002, which establishes risk awareness, safe isolation and documentation practices. A second gateway is high-voltage maintenance competence, covering non-live interventions on battery systems and orange-cable circuits. A third concerns EV/hybrid electrical work that integrates secure diagnostics, OEM procedures and *jännitteettömäksi tekeminen* (de-energisation) protocols. Only under defined prerequisites and workplace experience should live-work authorisation be granted for circumscribed tasks when *jännitetty työ* cannot be avoided (SESKO, 2025; SFS, 2025). Each step requires explicit admission criteria (prior module completion and supervised experience), externally validated assessment tasks, and transparent rules for recognition of prior learning to ensure that micro-credentials operate as professional guarantees rather than certificates of attendance (Council of the European Union, 2022; Finlex, 2017).

To support portability across providers and regions, every entry in Table 1 that is converted into a micro-credential should be issued in a digitally verifiable format with standardised descriptors. The European Digital Credentials infrastructure enables tamper-evident, machine-readable credentials; combining EDC issuance with ESCO-based skill descriptors and, where feasible, NQF/EQF referencing, allows employers to verify origin, authenticity and content immediately, while preserving learner control (European Commission, 2025; Opetushallitus, 2025c). This approach also accommodates regional heterogeneity: providers such as Samiedu and Esedu can tailor learning activities and workplace contexts to local workshop profiles, yet produce nationally portable competence evidence through shared metadata and digital sealing (Samiedu, 2025; Esedu, 2025).

Workload and level should be calibrated to the task complexity shown in Table 1. Foundational electrical safety credentials can be short, but must include observed performance and documentation checks under realistic conditions; high-voltage maintenance typically requires extended supervised practice and documented job logs; EV/hybrid electrical work and especially live-work require stringent prerequisites, verified prior completions and external moderation of assessment samples to ensure comparability across providers (SESKO, 2025; SFS, 2025). Recognition of prior learning may substitute for parts of the pathway only when workplace artefacts—diagnostic logs, video evidence, structured checklists—demonstrate equivalence under the same assessment regime, thereby protecting minimum competence thresholds (Council of the European Union, 2022; Finlex, 2017).

Finally, the conversion of the Table 1 offerings into recognisable micro-credentials should be coupled to skills-intelligence triggers and funding conditions. By linking providers' refresh cycles to JOTPA's annually updated *Osaamistarvekompassi* signals, regional ecosystems can re-weight modules towards diagnostics, ADAS calibration or battery refurbishment as demand evolves. Conditioning ERDF/ESF+ and JOTPA support on EDC issuance, ESCO tagging and gateway compliance aligns regional agility with a common architecture for comparability and oversight (JOTPA, 2025; OECD, 2025). In effect, Table 1 becomes not only an inventory of current provision but the scaffold for a governed progression in which micro-credentials deliver responsiveness without sacrificing regulated quality and portability.

1.4.2 Assessment of Sectoral Skill Modules for Stackability and Quality

Assessment is the decisive design variable that determines whether micro-credentials operate as verifiable competence guarantees or remain informal certificates of attendance. In the automotive maintenance and repair sector, prevailing practices—provider-generated multiple-choice tests and unmoderated practical demonstrations—do not deliver the comparability, external validation or evidentiary quality required for portability and public trust. This weakness is particularly consequential in safety-critical contexts such as high-voltage work, where risk management is codified in the national electrical safety standard and where employers expect demonstrable capability rather than mere course participation (SFS, 2025; Autoalan keskusliitto, 2025; OECD, 2025).

A fit-for-purpose model must align assessment with the agility–legitimacy dilemma identified earlier. Agility is preserved by allowing providers to deploy short, targeted modules and assess learners under realistic workshop conditions; legitimacy is restored through externally moderated, evidence-based verification that yields portable, machine-readable credentials. Concretely, assessments should be task-based and explicitly aligned with the procedural expectations and risk categories recognised in SFS 6002: foundational electrical safety credentials must require safe isolation and documentation under realistic conditions; high-voltage maintenance credentials must include battery pack handling and interventions on orange-cable circuits; advanced EV/hybrid electrical work must integrate secure diagnostics, OEM procedures and *jännitteettömäksi tekeminen* (de-energisation) protocols; and any authorisation for *jännitetty työ* (live work) must involve controlled execution of prescribed tasks under supervision with clear organisational responsibilities (SFS, 2025; OECD, 2025).

External moderation secures assessment comparability across providers without over-bureaucratisation. Panels convened by sector bodies (e.g. Autoalan keskusliitto) and/or national authorities (e.g. Opetushallitus/EDUFI) should audit sampled assessment artefacts using structured rubrics and risk-aligned performance criteria. Sampling—rather than continuous third-party presence—reduces administrative burden while establishing system-level trust in assessment results. Moderation cycles can be tied to provider refresh schedules so that quality assurance is integrated into normal delivery, not appended as an exceptional requirement (Autoalan keskusliitto, 2025; Opetushallitus, 2025c).

To ensure that competence claims are verifiable and portable, assessments must generate digital evidence that is attached to the credential itself. Evidence packages should include short video demonstrations of key tasks, diagnostic logs extracted from OEM or independent tools, and structured checklists documenting safe-work behaviours and completion of required steps. Issuance as European Digital Credentials with embedded metadata—learning outcomes, ESCO-based descriptors, workload, level and verification hash—enables instant authenticity checks in employer workflows, while preserving learner control through wallet-based storage. Where feasible, referencing to the NQF/EQF further supports transparency and comparability across providers and regions (European Commission, 2025; Opetushallitus, 2025c; Opetushallitus, 2020).

Recognition of prior learning (RPL) should be integrated as a regulated substitution mechanism, not an exception. Workplace artefacts may substitute for parts of a pathway only when they meet the same performance criteria and moderation standards as provider-generated assessments. This protects minimum competence thresholds and prevents bypassing of foundational skills—exactly the problem stackability design seeks to avoid (Council of the European Union, 2022; Finlex, 2017).

Operational placement across initial VET and in-work learning must respect programme scope and employer realities. Foundational electrical safety—and, where capacity permits, high-voltage maintenance—can be

delivered in initial VET for receptive learners; advanced EV/hybrid electrical work and any live-work authorisation occur post-graduation, contingent on documented workplace experience, prior gateway completions and successful moderation of assessment artefacts. This sequencing maintains the integrity of core three-year programmes—chassis, brakes, routine maintenance and basic electrics—while enabling specialisation through stackable micro-credentials acquired in work (OECD, 2025; Autoalan keskusliitto, 2025; Eperusteet, 2025a; Eperusteet, 2025b; Eperusteet, 2025c).

Assessment rubrics should embed employer expectations alongside technical performance. In addition to risk-aligned task criteria, rubrics must cover professional conduct, adherence to safety protocols, teamwork and customer communication, reflecting the sector's emphasis on sound basics, work-readiness and a demonstrable willingness to learn. These behavioural dimensions ensure that micro-credentials certify capability and safety culture, not only discrete technical acts (Autoalan keskusliitto, 2025; OECD, 2025).

Workshop logistics must be SME-friendly. Practical tasks should be assessed in situ under normal workflow with short observation windows, structured checklists and digital capture to minimise disruption. External moderation proceeds through periodic audits of anonymised evidence packages, maintaining comparability without imposing continuous third-party presence. Providers can batch evidence generation and moderation to align with natural training cycles, reducing downtime and administrative overhead (Opetushallitus, 2025c; OECD, 2025).

Finally, this assessment architecture supports policy experimentation and funding alignment without compromising scientific traceability. Regionally piloted moderation protocols and digital-evidence workflows can be financed through EU Structural Funds and regional implementation instruments, with support conditioned on compliance with external moderation and EDC issuance. Coupling providers' refresh cycles to regional development and funding frameworks ensures that assessments and micro-credential offerings are re-weighted toward emerging tasks (diagnostics, ADAS calibration, battery refurbishment) while remaining within a common, auditable framework (Structural Funds Finland, 2025; South Savo Regional Council, 2025; Ministry of Education and Culture, 2024b).

1.4.3 Limitations on Verifiability and Transferability

Digital verifiability is a cornerstone of a credible micro-credential ecosystem. Without a common architecture for credential issuance and metadata, even high-quality local provision remains locked within provider boundaries, limiting portability and employer trust. Current short courses in the automotive sector rarely implement interoperable credentialing; certificates are typically paper-based or issued as static PDFs, which cannot guarantee authenticity or support machine-readable comparison (Opetushallitus, 2025c; European Commission, 2025).

To address this gap, Finland should adopt the European Digital Credentials (EDC) infrastructure as the default issuance format for micro-credentials. EDC provides tamper-evident, machine-readable credentials that embed structured metadata, enabling instant authenticity checks and learner-controlled storage in digital wallets (European Commission, 2025). Each credential should include learning outcomes expressed in competence terms, workload and level descriptors referencing NQF/EQF where applicable, ESCO-based skill tags for semantic interoperability, and a verification hash to ensure integrity across systems (Opetushallitus, 2020; Opetushallitus, 2025c).

This metadata architecture supports transparency and comparability across providers and regions. For example, micro-credentials issued by Samiedu or Esedu for high-voltage safety can be instantly recognised by employers

in other regions or Member States, provided they share the same ESCO descriptors and EQF level references (Samiedu, 2025; Esedu, 2025). It also enables integration with European platforms such as Europass, which facilitate visibility and portability for learners (European Commission, 2025).

Digital credentialing should be coupled with quality assurance and funding conditions. Regional development instruments and EU Structural Funds can require EDC issuance and metadata compliance as eligibility criteria for co-financing, ensuring that public investment accelerates adoption of interoperable standards (Structural Funds Finland, 2025; South Savo Regional Council, 2025). This approach transforms digital infrastructure from a passive context into an active governance lever, aligning agility in module deployment with systemic legitimacy and portability. This converts digital credentialing from passive context to active governance, ensuring public investment scales verifiable, portable MCs rather than isolated short courses.

Finally, the deployment of EDC should be integrated with skills-intelligence triggers. When regional foresight and development frameworks signal emerging competence clusters—such as ADAS calibration or secure diagnostics—providers can update metadata templates and ESCO tags to reflect new skill taxonomies, ensuring that digital credentials remain current and machine-readable. This dynamic coupling of intelligence, credentialing and funding creates a responsive yet auditable ecosystem consistent with Finland’s competence-based VET framework and European portability principles (OECD, 2025; Council of the European Union, 2022). Sector bodies (e.g., AKL) should operate a credential registry for safety-critical competences to support compliance and insurance checks. Public co-financing can require registry publication and EDC/ESCO compliance as eligibility conditions.

1.4.4 Gaps in the MC Provision

Stackability is often presented as the capacity to accumulate short learning units; however, in safety-critical domains such as automotive electrification, accumulation without governance risks bypassing foundational competences and eroding public trust. In Finland’s competence-based VET, the Act on Vocational Education and Training (531/2017) already provides mechanisms for modular progression and the validation of prior learning, but the effectiveness of these mechanisms depends on clear gateways and auditable assessment that protect minimum thresholds across the pathway from basic electrical safety to authorised live work (Finlex, 2017; Eperusteet, 2025a; Eperusteet, 2025b; Eperusteet, 2025c).

A governed stackability model should make transitions explicit and conditional. The first gateway is foundational electrical safety competence, where risk awareness, safe isolation and documentation are established. The second concerns high-voltage maintenance, limited to non-live interventions on battery systems and orange-cable circuits. The third integrates secure diagnostics, OEM procedures and de-energisation protocols in EV/hybrid electrical work. Only under defined prerequisites—verified completions of earlier gateways, documented workplace experience and successful externally moderated assessments—should live-work authorisation be granted for circumscribed tasks where work under voltage cannot be avoided (SFS, 2025; OECD, 2025). Making these gateways explicit transforms stackability into governed progression, ensuring that micro-credentials function as professional guarantees rather than certificates of attendance (Council of the European Union, 2022; OECD, 2025).

Recognition of prior learning must be integrated as a regulated substitution mechanism. In a competence-based system, prior learning demonstrated in the workplace can shorten pathways; however, substitution is acceptable only when artefacts—diagnostic logs, video evidence and structured checklists—meet the same performance

criteria as provider-assessed tasks and are subject to external moderation. This approach is consistent with the Council Recommendation on micro-credentials, which requires clearly specified learning outcomes and reliable assessment, and with national regulation that enables RPL within qualification units (Council of the European Union, 2022; Finlex, 2017). In practice, RPL should be permitted only at gateways where equivalence can be demonstrated under identical standards, thereby protecting foundational competences while recognising experienced practitioners. Stackability is thus governed progression, not accumulation; gateway compliance and moderated RPL protect foundational competence while enabling experienced practitioners to advance.

Portability and transparency in stackability depend on standardised metadata and digitally verifiable issuance. Describing each micro-credential with learning outcomes, workload and level descriptors, ESCO-based skill tags, and (where feasible) NQF/EQF references enables machine-readable comparison and supports recognition across providers and regions (Opetushallitus, 2020; Opetushallitus, 2025c). Issuing credentials as European Digital Credentials embeds this metadata and allows employers to instantly verify origin and authenticity, while learners retain wallet-based control over their records (European Commission, 2025; Opetushallitus, 2025c). In the regional context, providers such as Samiedu and Esedu can tailor learning activities to local workshop profiles but still produce nationally portable evidence through shared descriptors and digital sealing (Samiedu, 2025; Esedu, 2025).

Implementation requires coupling governed progression to programme and funding instruments. Regional development frameworks and EU Structural Funds can set eligibility conditions that reinforce gateway compliance and digital issuance, ensuring that public co-financing accelerates adoption of interoperable and auditable micro-credential architectures rather than isolated short courses (Structural Funds Finland, 2025; South Savo Regional Council, 2025). This policy alignment addresses the systemic tension between agility and legitimacy documented in international evaluations by enabling rapid module deployment while preserving quality assurance, comparability and learner rights (OECD, 2025; Council of the European Union, 2022).

In sum, stackability in Finland's automotive sector should be understood as governed progression anchored in explicit gateways, reliable assessment and regulated RPL. Combining these design choices with digital verifiability and transparent metadata ensures that micro-credentials support adult upskilling and mobility without compromising safety, equity or public oversight (Finlex, 2017; Opetushallitus, 2025c; European Commission, 2025).

1.5 Effectiveness of microcredential implementation

This chapter assesses how micro-credentials (MCs) function in Finland's automotive maintenance and repair sector as instruments for upskilling during the green and digital transition. The analytical focus is fourfold: first, uptake and use among employers and learners; second, labour-market relevance with respect to high-voltage systems, diagnostics and ADAS; third, trust and recognition, including assessment credibility and portability; and fourth, outcomes, such as progression in work and mobility across providers. The evaluation is grounded in national system features—competence-based VET architecture, modular qualification units and recognition of prior learning (RPL)—and in sector evidence from employers, providers and standards (Finlex, 2017; Eperusteet, 2025a; Eperusteet, 2025b; Eperusteet, 2025c; SFS, 2025).

Effectiveness must be read against the sector's transformation drivers. Electrification and software-centred service processes are reshaping workshop tasks, increasing demand for risk-managed high-voltage competence and secure diagnostics, while demographic and regional factors require modular adult learning pathways that minimise

downtime for SMEs (OECD, 2025; AUTOCOVE 2.0, 2024). At the same time, employers continue to rely on foundational skills—chassis, brakes, routine maintenance and basic electrics—as the baseline for safe and efficient operations, and they do not expect deep EV/HV expertise at graduation from initial VET. Instead, they value work-readiness and the willingness to learn, with specialisation acquired in work through short, targeted modules (Autoalan keskusliitto, 2025; Eperusteet, 2025a). This has direct implications for the appropriate positioning of MCs: they are most effective when serving as advanced, stackable specialisations that complement the core qualification profile rather than attempting to compress advanced EV/HV content into the three-year upper-secondary programme (OECD, 2025; Eperusteet, 2025b).

From a governance perspective, effectiveness hinges on the balance between agility and legitimacy. Industry-aligned short courses can be deployed rapidly and are trusted in practice, yet without externally validated assessment and interoperable credentialing they struggle to achieve portability and public oversight. Conversely, regulated pathways offer equity and quality assurance but may refresh content more slowly than technology evolves. In the automotive case, the updated electrical safety standard clarifies competence expectations and organisational responsibilities for high-voltage work; however, standards alone do not guarantee assessment comparability across providers or recognisability in hiring (SFS, 2025; OECD, 2025). MCs are therefore effective only insofar as they incorporate task-based assessments aligned with risk categories, adopt external moderation to secure comparability, and are digitally issued with transparent metadata so that employers can verify origin, authenticity and content (Council of the European Union, 2022; Opetushallitus, 2025c; European Commission, 2025).

Evaluation also requires attention to data and evidence. National statistics and provider registers document cohort sizes and qualification structures, but systematic indicators on MC uptake, stackability and impact remain nascent (Opetushallinnon tilastopalvelu Vipunen, 2025; Eperusteet, 2025c). Employer-side findings from internal surveys and interviews suggest recognition conditions: short courses are used when practice-near and provider-neutral, but their value increases markedly when assessment artefacts and credential data are externally auditable (CQ Systems, 2025; AutoCredify, 2025). In the absence of audited assessment and digital verifiability, MCs risk operating as locality-bound tokens of attendance. Conversely, when credentials embed learning outcomes, workload/level descriptors and ESCO-based skill tags, and are issued in machine-readable formats, they support mobility across providers and regions, aligning with European comparability instruments (Opetushallitus, 2020; European Commission, 2025).

The chapter proceeds by applying these criteria to the Finnish automotive context. Section 5.1 examines employer and learner perceptions and use in light of foundational competence expectations and in-work specialisation (Autoalan keskusliitto, 2025; Eperusteet, 2025a). Section 5.2 assesses labour-market relevance, connecting MC content to high-voltage safety, diagnostics and ADAS tasks identified in sector analyses (OECD, 2025; AUTOCOVE 2.0, 2024). Section 5.3 analyses adoption enablers and barriers, including SME capacity, cost and awareness, set against quality assurance and portability constraints (Statistics Finland, 2025a; Statistics Finland, 2025b). Section 5.4 evaluates recognition and trust, focusing on assessment credibility, external moderation, NQF/EQF referencing and digital issuance (Council of the European Union, 2022; Opetushallitus, 2025c; European Commission, 2025). Section 5.5 discusses outcomes and impact, noting current data limitations and identifying feasible indicators—progression to higher-risk tasks, cross-provider mobility and hiring use—to be embedded in future monitoring (Opetushallinnon tilastopalvelu Vipunen, 2025; OECD, 2025). Throughout, the analysis incorporates practitioner insights that foundational competence must remain central in initial VET and that MCs are most effective as governed, stackable specialisations acquired in work, thus aligning employer expectations with regulated quality and portable evidence (Autoalan keskusliitto, 2025; Eperusteet, 2025b).

1.5.1 Skills gaps and mismatches linked to the green and digital transitions

Employer and learner perceptions strongly influence the effectiveness of micro-credentials in Finland’s automotive sector. Evidence from interviews and sector surveys indicates that employers do not expect graduates of initial VET programmes to possess deep expertise in electric or hybrid systems; rather, they prioritise mastery of foundational competences—chassis, brakes, routine maintenance and basic electrics—combined with work-readiness and a willingness to learn (Autoalan keskusliitto, 2025; Eperusteet, 2025a; Eperusteet, 2025b). This expectation reflects the structural limits of three-year upper-secondary programmes, which cannot accommodate advanced EV/HV content without displacing core skills. Consequently, employers view micro-credentials as supplementary specialisations acquired post-graduation and in work, rather than as substitutes for full qualifications (OECD, 2025).

Learner perceptions mirror this logic. Adult learners and career changers value short, targeted modules that enable rapid competence acquisition without committing to full qualifications, particularly when modules are recognised across providers and linked to clear labour-market outcomes. However, awareness of micro-credentials remains uneven, and trust depends on transparent assessment and portability. Interviews suggest that learners perceive the greatest value when credentials are externally validated, digitally verifiable and referenced to national or European frameworks, as these features signal legitimacy and enhance career mobility (Opetushallitus, 2025c; European Commission, 2025).

Employers report using short courses primarily for compliance and risk management—such as electrical safety aligned with SFS 6002—while expressing caution about credentials lacking audited assessment or standardised metadata. In practice, micro-credentials gain traction when they function as professional guarantees for safety-critical tasks, supported by external moderation and machine-readable credentialing. Without these features, uptake remains limited and credentials risk being treated as locality-bound tokens of attendance rather than portable evidence of competence (SFS, 2025; Council of the European Union, 2022).

The patterns shown in Table 2 and Table 3 reinforce these perceptions. Current gaps cluster around customer service, fault diagnostics and basic electrical competence, while future gaps shift decisively toward electric/hybrid vehicle repair, advanced electronics and battery technologies. This trajectory confirms that micro-credentials must address emerging technical domains without displacing foundational skills in initial VET. Employers’ emphasis on customer service and diagnostics across both lists also signals that MC design should integrate technical and interactional competences. These findings support the positioning of MCs as governed, stackable specialisations acquired in work, with transparent assessment and digital verifiability to ensure portability and trust.

Table 2. Current skill gaps based on answers of 66 Finnish Automotive sector companies in Finland (CQ Systems (2025)).

Ranking according to importance	Skill
1	Customer service orientation, responsiveness, customer service skills
2	Vehicle fault detection, repair-need assessment, fault diagnostics
3	Knowledge of vehicle electrical systems
4	Brand-specific knowledge for motor vehicles (OEM familiarity)
5	Repair and maintenance of vehicle air-conditioning

6	Command of English professional terminology
7	Proficiency with diagnostic testers (scan tools)
8	Practical hands-on skills
9	Occupational safety competence; understanding of safety regulations and instructions
10	Proficiency with automotive computer software
11	Ability to use ICT in one's work
12	Competence in spare parts procurement
13	Basic electrical engineering skills in the automotive domain
14	Proficiency with Automaster software
15	Proficiency in brake work

Table 3. Future skill gaps based on answers of 66 Finnish Automotive sector companies in Finland (CQ Systems (2025)).

Ranking according to importance	Skill
1	Ability to repair electric and hybrid vehicles
2	Vehicle fault detection, repair-need assessment, fault diagnostics
3	Customer service orientation, responsiveness, customer service skills
4	Knowledge related to electric vehicles and their technology
5	Maintenance competence for vehicle electrical systems
6	Staying current with technical development; adopting new technologies
7	Knowledge of automotive electronics
8	Command of English professional terminology
9	Electrical engineering competence
10	Brand-specific knowledge for motor vehicles (OEM familiarity)
11	Proficiency with automotive computer software
12	Sales skills; ability to conclude deals
13	Environmental awareness; environmentally positive, ecological attitude
14	Competence related to battery-based energy solutions and battery technology
15	Knowledge of control-circuit components (switches, displays, panels, indicators, sensors)

1.5.2 Emerging occupations—or technology-specific skill clusters?

The labour-market relevance of micro-credentials in Finland's automotive sector is shaped by the dual pressures of the green and digital transition. Electrification and software-centric service processes are transforming workshop tasks, creating demand for competences that extend beyond the traditional mechanical skill set. The patterns documented in Table 2 and Table 3 illustrate this trajectory: while current gaps cluster around customer service, fault diagnostics and basic electrical knowledge, future gaps shift decisively toward electric and hybrid vehicle repair, advanced electronics, battery technologies and control-circuit components. These findings confirm that micro-credentials must target emerging technical domains without displacing foundational competences delivered in initial VET (CQ Systems, 2025; OECD, 2025).

Employer interviews and sector analyses reinforce this interpretation. High-voltage safety, secure diagnostics and ADAS calibration are repeatedly cited as priority areas, alongside cross-cutting digital skills such as software handling and CAN-bus communication. At the same time, customer interaction and service orientation remain prominent across both current and future lists, signalling that technical specialisation alone is insufficient; micro-credentials should integrate behavioural and communication competences to reflect the hybrid nature of modern automotive work (Autoalan keskusliitto, 2025; AUTOCOVE 2.0, 2024).

The relevance of micro-credentials is further amplified by regulatory and market drivers. Finland's legally binding carbon-neutrality target for 2035 accelerates the diffusion of electric vehicles and battery-based energy systems, while OEMs increasingly embed proprietary software and remote diagnostics into maintenance workflows. These developments require rapid competence updates that traditional qualification cycles cannot deliver. Micro-credentials, when governed through explicit gateways and externally validated assessment, provide a mechanism to align workforce skills with evolving standards such as SFS 6002:2025, which codifies risk categories and organisational responsibilities for electrical work (SFS, 2025; Council of the European Union, 2022).

In sum, labour-market relevance is not limited to technical depth; it encompasses adaptability to continuous innovation and integration of customer-facing skills. The evidence from Tables 2 and 3 underscores the need for micro-credentials that combine advanced EV/HV competences with digital literacy and service orientation, issued in interoperable formats to support mobility across providers and regions. This alignment between emerging skill clusters and credential design is essential for ensuring that micro-credentials function as credible instruments of lifelong learning rather than fragmented short courses (OECD, 2025; Opetushallitus, 2025c).

1.5.3 Gaps in the existing training offer

The adoption of micro-credentials in Finland's automotive sector is shaped by organisational, financial and systemic factors. At the organisational level, small and medium-sized enterprises (SMEs) dominate the workshop landscape, and their capacity to release staff for training is constrained by tight margins and limited redundancy. Employers emphasise that downtime must be minimised and learning integrated into normal workflows, which favours short, practice-near modules delivered flexibly and assessed in situ (Autoalan keskusliitto, 2025; OECD, 2025). This requirement aligns with Tuomo's observation that micro-credentials should complement rather than displace core VET competences, enabling specialisation without disrupting essential service provision.

Financial barriers persist despite public co-financing mechanisms. While initial VET is tuition-free, continuing education often involves direct costs for learners or employers. Awareness of funding instruments—such as regional development programmes and EU Structural Funds—is uneven, and application processes can be complex for

smaller firms. Conditioning co-financing on interoperable credentialing and moderated assessment could incentivise adoption while safeguarding quality, but this presupposes clear guidance and administrative support (Structural Funds Finland, 2025; South Savo Regional Council, 2025).

Systemic barriers relate to quality assurance and portability. Employers report reluctance to invest in short courses that lack externally validated assessment or standardised metadata, as such credentials offer limited value in recruitment or compliance audits. Conversely, adoption accelerates when micro-credentials are issued as European Digital Credentials with embedded learning outcomes, workload and ESCO descriptors, and when assessment artefacts are subject to external moderation (European Commission, 2025; Opetushallitus, 2025c). These features convert micro-credentials from locality-bound certificates into portable, auditable evidence of competence.

Cultural factors also influence uptake. Interviews suggest that while learners appreciate modularity and flexibility, awareness of micro-credentials as a recognised format remains low outside pilot contexts. Employers often conflate micro-credentials with informal short courses, underscoring the need for communication strategies that clarify their governance, portability and career value (AutoCredify, 2025; CQ Systems, 2025). Without this clarity, micro-credentials risk being perceived as marginal rather than integral to lifelong learning pathways.

In sum, adoption depends on aligning design with SME realities, embedding digital verifiability and moderation into credentialing, and coupling funding incentives to compliance with these standards. Addressing these barriers is essential for scaling micro-credentials as credible instruments of workforce development rather than fragmented offerings (OECD, 2025; Council of the European Union, 2022).

1.5.4 Recognition and trust

Recognition and trust are decisive for the effectiveness of micro-credentials in the automotive sector. Employers consistently emphasise that short courses have limited value unless they provide externally validated evidence of competence. This concern is amplified in safety-critical domains such as high-voltage work, where risk management is codified in SFS 6002:2025 but assessment practices remain heterogeneous across providers (SFS, 2025; Autoalan keskusliitto, 2025). Without comparability and auditability, micro-credentials risk being perceived as informal certificates rather than professional guarantees.

Trust depends on three interlocking conditions. First, assessment credibility: competence must be demonstrated through task-based practicals aligned with risk categories and moderated externally to ensure systemic reliability. Second, framework anchoring: referencing learning outcomes to the Finnish National Qualifications Framework and, where feasible, the European Qualifications Framework signals alignment with regulated standards and supports portability (Finlex, 2017; Opetushallitus, 2020). Third, digital verifiability: issuing credentials as European Digital Credentials embeds metadata—learning outcomes, workload, level descriptors and ESCO skill tags—enabling instant authenticity checks and machine-readable comparison across providers and regions (European Commission, 2025; Opetushallitus, 2025c).

Employer interviews confirm that these features transform micro-credentials from locality-bound tokens into auditable evidence usable in recruitment and compliance audits. Learners likewise perceive greater career value when credentials are portable and recognised beyond the issuing provider. Conversely, absence of these conditions undermines trust and limits uptake, regardless of technical content (CQ Systems, 2025; AutoCredify, 2025).

Recognition also extends to stackability and RPL. Employers support modular progression provided that gateways are explicit and substitution through prior learning is auditable under identical standards. This approach aligns with the Council Recommendation on micro-credentials, which requires clearly specified learning outcomes and reliable

assessment as prerequisites for recognition across contexts (Council of the European Union, 2022). Embedding these principles in Finnish practice ensures that micro-credentials function as institutional instruments for lifelong learning rather than fragmented short courses.

1.5.5 Barriers to access and adoption

Scaling micro-credentials in Finland's automotive sector is constrained by a combination of access and adoption barriers. Access barriers include financial costs for learners and SMEs, which remain significant despite public co-financing mechanisms. While initial VET is tuition-free, continuing education often involves direct fees, and awareness of funding instruments—such as regional development programmes and EU Structural Funds—is uneven. Application processes can be complex for smaller firms, and regional disparities in provision exacerbate inequalities in access, particularly where digital infrastructure for credential issuance is underdeveloped (Structural Funds Finland, 2025; South Savo Regional Council, 2025; Statistics Finland, 2025a; Statistics Finland, 2025b).

Time constraints represent another critical barrier. SMEs operate with limited redundancy, making it difficult to release staff for training without disrupting service delivery. Employers emphasise the need for short, practice-near modules integrated into normal workflows, yet many current offerings require off-site attendance or rigid scheduling, reducing feasibility for smaller workshops (Autoalan keskusliitto, 2025; CQ Systems, 2025).

Adoption barriers relate primarily to trust and portability. Employers are reluctant to invest in short courses that lack externally validated assessment or standardised metadata, as such credentials offer limited value in recruitment or compliance audits. Similarly, learners perceive low career utility when credentials are not recognised beyond the issuing provider. Absence of digital verifiability—such as European Digital Credentials with embedded learning outcomes, workload descriptors and ESCO skill tags—further undermines portability (European Commission, 2025; Opetushallitus, 2025c). Cultural factors compound these challenges: interviews suggest that micro-credentials are often conflated with informal short courses, and awareness of their governance and career relevance remains low outside pilot contexts (AutoCredify, 2025; CQ Systems, 2025).

Addressing these barriers requires a multi-level response. Funding instruments should condition support on compliance with quality assurance standards, including moderated assessment and interoperable credentialing. Communication strategies are needed to clarify the distinction between micro-credentials and informal training, emphasising their portability and alignment with national and European frameworks. Finally, embedding SME-friendly delivery models—such as in-situ assessment and modular scheduling—will reduce downtime and improve feasibility for smaller firms. Without these measures, micro-credentials risk remaining fragmented offerings rather than systemic tools for lifelong learning (OECD, 2025; Council of the European Union, 2022).

1.5.6 Mechanisms for content renewal

The capacity to refresh content rapidly is critical for ensuring that micro-credentials remain aligned with evolving competence needs in the automotive sector. Finland's VET system provides a structural basis for modular updates through the competence-based architecture introduced by the Act on Vocational Education and Training (531/2017), which enables flexible revision of qualification units and integration of recognition of prior learning (Finlex, 2017; Eperusteet, 2025a–c). However, traditional update cycles—often spanning several years—are insufficient to match the pace of technological change in electrification, diagnostics and software-centric maintenance (OECD, 2025).

Current mechanisms for content renewal operate at multiple levels. At the national level, Opetushallitus coordinates qualification requirements and publishes updates through the Eperusteet service, while OKM sets strategic priorities for modularisation and lifelong learning (Opetushallitus, 2025b; Ministry of Education and Culture, 2025a). At the regional level, development frameworks and EU Structural Funds support targeted projects that enable providers to pilot new modules and adapt delivery formats to employer needs (Structural Funds Finland, 2025; South Savo Regional Council, 2025). These instruments can be leveraged to accelerate micro-credential updates by conditioning funding on compliance with interoperable credentialing and moderated assessment standards.

Skills intelligence is the primary trigger for content renewal. Employer surveys and foresight studies—such as those summarised in Tables 2 and 3—highlight emerging gaps in EV/HV repair, battery technologies and digital diagnostics (CQ Systems, 2025; AUTOCOVE 2.0, 2024). Integrating these signals into curriculum design requires systematic coupling between intelligence outputs and provider refresh cycles. While national statistics and foresight reports provide long-term projections, near-term responsiveness depends on continuous monitoring of job postings, investment trends and OEM requirements. Embedding these triggers into micro-credential governance would allow annual or semi-annual updates without compromising quality assurance.

Policy experimentation offers a pathway to operationalise these mechanisms. Pilots can test rapid update protocols for micro-credentials, using modular templates that incorporate ESCO skill tags and NQF/EQF references. Digital credentialing platforms such as the European Digital Credentials infrastructure enable version control and metadata updates, ensuring that refreshed content remains portable and machine-readable (European Commission, 2025; Opetushallitus, 2025c). Coupling these technical solutions with funding incentives and regional coordination would transform content renewal from a reactive process into a proactive governance function, aligning micro-credentials with Finland's climate neutrality and digitalisation objectives (Council of the European Union, 2022; OECD, 2025).

1.5.7 Skills intelligence and its role in agile content renewal

Finland's skills-intelligence system has undergone a major transition. The former Osaamisen ennakointifoorumi (OEF), which operated from 2017 to 2024, has been replaced by a more integrated anticipation model centred on the Service Centre for Continuous Learning and Employment (JOTPA). JOTPA now coordinates short- and medium-term skills forecasting from a continuous learning perspective, focusing on workforce matching and modular upskilling. Its flagship tool, Osaamistarvekompassi, aggregates labour-market signals—including job postings, investment trends and regional outlooks—using AI-assisted analytics to produce annually refreshed competence clusters (Ministry of Education and Culture, 2024; OECD, 2025). These outputs are designed to inform providers' decisions on curriculum renewal and micro-credential design, marking a shift from static, forum-based anticipation to dynamic, data-driven governance. Providers will open annual review windows where outputs from JOTPA's Osaamistarvekompassi, updates to SFS 6002 annexes, and OEM technical bulletins automatically trigger refresh of learning outcomes, task specifications and credential metadata.

Despite this progress, deployment gaps remain. Intelligence streams—CQ Systems employer survey, AutoCredify interviews, Vipunen statistics, regional ELY outlooks and European foresight (Cedefop, AUTOCOVE)—are credible but fragmented. They are not systematically translated into audited assessment tasks, digital credential metadata or gateway rules for stackability, slowing responsiveness in technology fields where OEM standards and regulatory updates move faster than conventional qualification cycles (CQ Systems, 2025; AutoCredify, 2025; Cedefop, 2025). Interviews confirm that educators and employers favour signal-driven renewal, where standards (e.g., SFS 6002 updates) and OEM bulletins act as automatic triggers for content refresh, supported by employer validation loops and structured learner feedback (SFS, 2025; Autoalan keskusliitto, 2025).

Policy experimentation can operationalise this logic. Pilots could test AI-based trigger scanning—for example, using platforms like HeadAI to monitor job ads and technical bulletins—and link these signals to modular update protocols for micro-credentials. Funding instruments, including regional development frameworks and EU Structural Funds, can condition support on compliance with rapid-update standards, moderated assessment and interoperable credentialing (Structural Funds Finland, 2025; South Savo Regional Council, 2025). Embedding these mechanisms would convert skills intelligence from a passive context into an active governance lever, enabling annualised content renewal without compromising quality assurance or portability.

In sum, Finland possesses the building blocks of a responsive skills-intelligence system, but its effectiveness for micro-credential development depends on integration and automation. Aligning JOTPA's anticipation outputs with provider refresh cycles, digital credentialing standards and funding incentives would create a coherent architecture for agile content renewal—consistent with the competence-based VET framework and European portability principles (Council of the European Union, 2022; European Commission, 2025; OECD, 2025).

1.6 Emerging skills needs and gaps

This chapter synthesises evidence on Finland's automotive sector competence trajectory under the green and digital transitions, drawing on employer surveys, interviews, and European foresight studies. The aim is to identify where current training provision diverges from emerging requirements and to assess the implications for micro-credential design and policy experimentation. The analysis builds on three complementary sources: the CQ Systems employer dataset (quantifying near-term priorities), the AutoCredify WP3 interview corpus (qualitative depth on workshop realities), and the AUTOCOVE 2.0 European trends report (macro-level context). Together, these sources confirm a structural shift from internal combustion engine (ICE) maintenance toward electrification, software-centric diagnostics, and advanced driver assistance systems (ADAS), while highlighting persistent gaps in foundational competence and customer-facing skills (CQ Systems, 2025; AutoCredify, 2025; AUTOCOVE 2.0, 2024).

The evidence points to a dual challenge. First, the scope and depth of emerging competencies—high-voltage safety, battery management, ADAS calibration, secure connected diagnostics—cannot be fully absorbed within the time and resource constraints of a three-year vocational qualification without displacing essential mechanical skills. Second, the velocity of technological change outpaces conventional curriculum refresh cycles, creating a lag between OEM standards and classroom content. These dynamics underscore the need for modular, verifiable learning units that can be deployed rapidly and stacked toward broader competence profiles, consistent with Finland’s competence-based VET architecture and the EU Council Recommendation on micro-credentials (Finlex, 2017; Council of the European Union, 2022; OECD, 2025).

The following sections examine this challenge in detail. Section 6.1 analyses current and future skill gaps, referencing employer data summarised in Table 2 and Table 3. Section 6.2 explores whether the transition creates new occupations or reconfigures existing roles into technology-specific clusters. Section 6.3 reviews gaps in the existing training offer and their governance implications. Sections 6.4–6.6 assess the functioning of skills-intelligence systems, barriers to access, and mechanisms for content renewal, while Section 6.7 considers how micro-credentials can align with real-time labour-market signals. Throughout, the analysis applies the agility-versus-legitimacy lens introduced earlier and identifies opportunities for policy experimentation, including employer validation loops, AI-based trigger scanning, and funding conditions tied to interoperable credentialing (OECD, 2025; Opetushallitus, 2025c; European Commission, 2025).

1.6.1 Skills gaps and mismatches linked to green and digital transition

Evidence from employer surveys and interviews confirms that Finland’s automotive sector faces a widening gap between the skills supplied by initial vocational education and those demanded by workshops adapting to electrification and digitalisation. Current competence shortfalls cluster around diagnostics, electrical systems, and software-based service processes, while future needs shift decisively toward high-voltage safety, battery management, ADAS calibration, and secure connected diagnostics (CQ Systems, 2025; AutoCredify, 2025; AUTOCOVE 2.0, 2024). These patterns are illustrated in Table 2 and Table 3, which summarise the top 15 skill gaps reported by Finnish employers for the present and the near future. The data show continuity in customer service and diagnostic skills across both lists, but also a marked increase in requirements for EV/HV repair, electronics, and battery technologies—competences that cannot be fully embedded in a three-year VET programme without displacing foundational mechanical skills.

Interviews highlight the tension between expanding competency portfolios and traditional VET structures. Employers stress that graduates must retain core mechanical capabilities—brakes, chassis, routine maintenance—while acquiring digital literacy and safety culture. However, the depth required for high-voltage competence alone competes with time needed for software diagnostics and ADAS calibration, creating a structural mismatch between qualification cycles and technology adoption rates. This mismatch is compounded by knowledge obsolescence: ADAS and battery technologies evolve faster than curricula can be revised, meaning that what is taught in year one may be outdated by graduation (OECD, 2025; Autoalan keskusliitto, 2025).

The governance implication is clear: agility in content renewal must be balanced with legitimacy and quality assurance. Micro-credentials offer a mechanism to address this tension by enabling rapid, targeted updates without compromising the integrity of full qualifications. When designed as stackable modules anchored to NQF/EQF frameworks and issued as European Digital Credentials, these units can certify discrete competences—such as HV isolation or ADAS calibration—while preserving portability and trust (Council of the European Union, 2022;

Opetushallitus, 2025c; European Commission, 2025). Without such mechanisms, the sector risks persistent skill gaps that undermine safety, productivity, and the green transition objectives embedded in Finland's climate neutrality target for 2035 (Ministry of Economic Affairs and Employment, 2025; OECD, 2025).

1.6.2 Emerging occupations or technology-specific skill clusters

Evidence from employer surveys and interviews suggests that the green and digital transitions in Finland's automotive sector are not creating entirely new occupations but are reshaping existing roles through modular clusters of specialised competences. Traditional job titles—mechanic, service technician, diagnostic specialist—remain in use, yet their task portfolios now include high-voltage isolation, battery diagnostics, ADAS calibration, and secure connected diagnostics alongside conventional mechanical work (CQ Systems, 2025; AutoCredify, 2025). This evolution reflects a structural shift toward electrification and software-centric servicing, where competence depth in specific domains matters more than occupational reclassification.

The AUTOCOVE 2.0 report confirms that this pattern is consistent across Europe: the aftermarket is experiencing a decline in internal combustion engine (ICE) maintenance and a rise in software-driven diagnostics and calibration processes (AUTOCOVE 2.0, 2024). Finnish interviews add nuance by highlighting cross-cutting requirements such as English-language proficiency for OEM documentation, digital tool mastery, and strict adherence to safety protocols under SFS 6002. These transversal skills intersect with technical clusters, reinforcing the case for micro-credentials as flexible instruments to certify discrete competences without requiring full qualification renewal (Council of the European Union, 2022; Opetushallitus, 2025c).

From a governance perspective, the challenge lies in balancing foundational competence with specialised expertise. Employers stress that micro-credentials should not bypass core basics—brakes, chassis, routine maintenance—but should enable rapid acquisition of advanced skills through stackable modules anchored to NQF/EQF frameworks. This approach supports agility in responding to OEM updates and regulatory changes while preserving legitimacy through externally validated assessment and digital verifiability (European Commission, 2025; OECD, 2025). Without such mechanisms, the sector risks fragmented provision and uneven recognition, undermining both safety and labour mobility.

Overall, the evidence indicates that the sector's transformation is not about creating new occupations but about embedding specialised, technology-driven skills into existing roles. This shift underscores the need for modular, verifiable training solutions that can keep pace with rapid technological change—a role that micro-credentials are well positioned to fulfil if they are designed to reflect real workshop tasks and validated by industry stakeholders (Brauer, 2023; Council of the European Union, 2022; Cedefop, 2024). However, agility in updating content cannot rely on full-scale curriculum reviews, which are resource-intensive and slow. A more feasible approach is to deploy skills taxonomies that clearly identify occupationally specific technology and regulatory competences. Such taxonomies would allow targeted updates to micro-credential modules without revising entire qualifications, reducing cost and accelerating responsiveness. This approach also aligns with international patterns: given the global structure of automotive value chains, emerging competence demands—high-voltage safety, battery diagnostics, ADAS calibration—are broadly similar across countries, reinforcing the case for interoperable frameworks and shared metadata standards (OECD, 2025; Opetushallitus, 2025c). Embedding taxonomy-driven review cycles into Finland's competence-based VET system could form the basis for policy experimentation, enabling annual refresh of micro-credential content triggered by standards updates, OEM bulletins, and labour-market signals, while preserving quality assurance and portability.

1.6.3 Gaps in existing training offer

Despite Finland's competence-based VET architecture and recent reforms aimed at modularisation, the current training offer in the automotive sector remains heavily weighted toward internal combustion engine (ICE) mechanics and conventional electrical systems. Interviews with educators and employers confirm that vocational curricula still prioritise mechanical fundamentals, while advanced diagnostics, high-voltage safety, and software-driven service processes receive limited and uneven coverage (AutoCredify, 2025; CQ Systems, 2025). This imbalance creates a structural lag between the skills demanded in modern workshops and those supplied by initial training pathways, forcing employers to rely on costly in-house training or ad hoc short courses to bridge competence gaps.

The CQ Systems competence analysis confirms these observations at national scale, identifying outdated curricula as a key barrier to workforce readiness. While some institutions have introduced modules on hybrid and EV technologies, these are often optional or delivered in formats that lack consistency and verifiable assessment. Educators interviewed acknowledge that curriculum renewal cycles are slow and resource-intensive, typically requiring several years to complete formal revisions of qualification requirements. This cadence is misaligned with the pace of technological change, where OEM updates and regulatory standards can shift within months (AutoCredify, 2025; OECD, 2025). Respondents suggested that full-scale reviews are impractical and advocated for lighter, signal-driven mechanisms—such as annual micro-credential updates triggered by standards changes and employer validation loops—rather than comprehensive rewrites. Embedding skills taxonomies that clearly identify occupationally specific technology and regulatory competences could enable targeted updates without revising entire qualifications, reducing cost and accelerating responsiveness. This approach could form the basis for policy experimentation, allowing Finland to test agile review models that combine employer input, regulatory triggers, and labour-market intelligence while preserving quality assurance and portability through NQF/EQF anchoring and digital credentialing (Council of the European Union, 2022; Opetushallitus, 2025c; European Commission, 2025).

Regional disparities compound the problem. Access to specialised EV and high-voltage training is uneven across Finland, with smaller vocational institutions and rural areas facing capacity constraints. Employers in these regions report limited affordable options for upskilling, particularly for SMEs operating on tight margins (Statistics Finland, 2025a; South Savo Regional Council, 2025). Inclusion gaps further restrict the talent pipeline: women and other underrepresented groups remain marginal in technical pathways, limiting workforce diversity and adaptability (AutoCredify, 2025).

From a governance perspective, the challenge is to reconcile agility with legitimacy. Frequent full-scale curriculum reviews are neither feasible nor cost-effective. A taxonomy-driven model would allow Finland to implement agile review cycles triggered by standards updates, OEM bulletins, and labour-market signals, while preserving quality assurance and portability through NQF/EQF anchoring and digital credentialing. Such mechanisms could form the basis for policy experimentation, reducing the structural lag between training provision and technological change (OECD, 2025; Opetushallitus, 2025c; European Commission, 2025).

1.6.4 Information sources used: skills intelligence systems, foresight, and employer input

As established in Chapter 5 (information sources), this section focuses on deployment and governance triggers rather than inventory, specifying how signals are operationalised into assessment tasks, metadata and gateway rules. The identification of emerging competence needs in Finland's automotive sector relies on multiple information streams that differ in granularity, refresh cycles, and usability for curriculum design. At the micro level, the CQ Systems employer survey provides detailed insights into current and future skill priorities, including diagnostics,

high-voltage safety, and digital tool proficiency. This is complemented by the AutoCredify WP3 interviews, which capture qualitative depth on workshop realities, assessment practices, and trust conditions for new credentials (CQ Systems, 2025; AutoCredify, 2025). Together, these sources reveal structural gaps in curriculum agility and underscore employer expectations for modular, verifiable learning units.

At the national level, Finland's skills anticipation system has recently undergone a major transition. The former Osaamisen ennakointifoorumi (OEF), which operated from 2017 to 2024, has been replaced by a more integrated model under the Service Centre for Continuous Learning and Employment (JOTPA). JOTPA now coordinates short- and medium-term forecasting from a continuous learning perspective and has introduced the Osaamistarvekompassi tool, which aggregates labour-market signals—including job postings and investment trends—using AI-assisted analytics to produce annually refreshed competence clusters (Ministry of Education and Culture, 2024; OECD, 2025). These outputs are intended to inform providers' decisions on modular provision and micro-credential design, marking a shift from static forum-based anticipation to dynamic, data-driven governance. However, interviews suggest that the translation of these signals into curriculum updates remains uneven, particularly at the occupational level for automotive mechanics, where rapid technological changes demand granular, task-specific intelligence.

Additional national sources include Vipunen, which provides enrolment and pipeline data for vocational programmes, and Statistics Finland, which offers sectoral structures and training expenditure patterns, contextualising adoption barriers for SMEs (Opetushallinnon tilastopalvelu, 2025; Statistics Finland, 2025a; 2025b). Regional actors such as ELY Centres and South Savo Regional Council publish development outlooks and manage funding streams, framing skills policy priorities but offering limited operational guidance for curriculum design (ELY Centres, 2025; South Savo Regional Council, 2025).

At the European level, Cedefop's Skills Forecast and AUTOCOVE 2.0 provide foresight on green and digital transitions, confirming that Finland's competence challenges—high-voltage safety, advanced diagnostics, and digital service processes—mirror continental patterns (Cedefop, 2025; AUTOCOVE 2.0, 2024). OECD's review of VET and the green transition adds a system lens, emphasising modular pathways and the need to connect skills intelligence to programme renewal at a faster cadence (OECD, 2025).

Despite the availability of these sources, deployment remains fragmented. Intelligence streams are not consistently or quickly translated into curriculum updates or micro-credential design, and refresh cycles lag behind technological change. Interviews indicate that real-time signals—such as OEM technical bulletins and regulatory updates—are underutilised in formal training development. This gap reinforces the need for structured integration mechanisms, including employer validation loops and taxonomy-driven review processes, which are explored in Sections 6.6 and 6.7 (AutoCredify, 2025; Autoalan keskusliitto, 2025).

1.6.5 Barriers to access: cost, delivery model inflexibility, and low awareness

Despite growing recognition of competence gaps, several structural barriers hinder the adoption of modular and verifiable training solutions in Finland's automotive sector. Cost is the most immediate obstacle for SMEs, which dominate the aftermarket and operate on tight margins. Employers report that high-voltage safety courses and OEM-specific diagnostic training often require significant investment, making it difficult to keep pace with technological change without targeted support (AutoCredify, 2025; CQ Systems, 2025). This financial constraint is reflected in national statistics on education expenditure by sector, which show limited training budgets among automotive companies compared to other industries (Statistics Finland, 2025b). For learners, cost disparities are equally pronounced: qualification units within formal vocational programmes are tuition-free, whereas micro-

credentials and short courses are typically fee-based, creating inequities in access (Ministry of Education and Culture, 2024; OECD, 2025).

Delivery model inflexibility compounds the problem. Traditional vocational programmes, such as the Vocational Qualification in Vehicle Technology (Ajoneuvoalan perustutkinto) and the Vocational Qualification in Automotive Industry (Autoalan perustutkinto), are structured around long qualification cycles that do not align with the urgent and modular nature of emerging competence needs. Employers and educators agree that micro-credentials could provide a solution by offering short, targeted learning units, but current pilots remain fragmented and lack consistent national recognition (Brauer, 2023; Opetushallitus, 2025a). Interviews reveal that even when modular courses exist, scheduling and geographic constraints limit participation, particularly for rural workshops and regions with fewer training providers (AutoCredify, 2025; South Savo Regional Council, 2025).

Awareness and trust represent additional barriers. Many SMEs are unfamiliar with the concept of micro-credentials or uncertain about their value in recruitment and career progression. This lack of understanding reduces demand for innovative training formats, even when they could address pressing skill gaps. Policy initiatives such as Digivisio 2030 and the Ministry of Education and Culture's draft framework for small learning units aim to improve visibility and trust, but interviews suggest that these efforts have yet to reach the majority of employers in the automotive sector (Digivisio 2030, 2025; Ministry of Education and Culture, 2024). Cultural factors further shape adoption: while Finland has a strong tradition of lifelong learning, participation remains uneven, and socio-economic constraints—time, cost, family responsibilities—restrict access for parts of the workforce (OECD, 2025).

Addressing these barriers requires coordinated action across governance, funding, and communication. Strategic levers include conditioning public co-financing on compliance with quality assurance standards (moderated assessment, EDC issuance), introducing learner support schemes (vouchers, tax incentives), and embedding SME-friendly delivery models such as in-situ assessment and modular scheduling. Without these measures, micro-credentials risk remaining fragmented offerings rather than systemic tools for lifelong learning (Council of the European Union, 2022; European Commission, 2025).

1.6.6 Mechanisms for content renewal: employer validation, sector updates, learner feedback, and labour market data

Ensuring that training content remains current in a fast-changing automotive environment requires mechanisms that refresh frequently without imposing the cost and complexity of full qualification reviews. Interviews with educators and employers emphasise that annual or semi-annual signal-driven updates are needed for safety-critical electrification tasks, ADAS calibration and secure diagnostics. However, frequent validation can be costly and demanding in terms of expertise, especially for smaller providers and SMEs (AutoCredify, 2025). The challenge is therefore to design lean, credible renewal processes that preserve quality assurance while remaining feasible in practice.

Employer validation is the most direct anchor for relevance, but its deployment must reflect sector realities. OECD evidence shows that, although employers are at the forefront of changing skills requirements, the involvement of Working Life Committees varies significantly across sectors and programmes; at local level, around 30% of employers report collaboration with VET institutions, and among those, 40% engage in educational collaboration on programme development and design. Collaboration is lower among startups and small companies that drive the green transition due to limited resources and time, and social partners may not yet be organised in emerging technology areas (OECD, 2025). In this context, rather than establishing large, permanent advisory boards—which are expensive to run repeatedly—a lean model is preferable: rotating sector panels convened periodically (e.g.,

once or twice per year) to review specific micro-credential modules, using sampling-based moderation of assessment artefacts (videos, diagnostic logs, checklists) to secure comparability across providers (Council of the European Union, 2022; Opetushallitus, 2025c).

Standards and OEM updates should function as automatic triggers for content refresh. The revised national electrical safety standard SFS 6002:2025 clarifies risk categories and organisational responsibilities; when annexes and technical notices change (e.g., EV/U annex, DC/T hazards), these updates ought to prompt immediate adjustments to assessment tasks and learning outcomes in the relevant micro-credentials (SFS, 2025). Similarly, OEM technical bulletins and access-rights procedures should be treated as event-driven inputs, with each provider maintaining a taxonomy-based mapping that links occupationally specific technology/regulatory competences (e.g., HV isolation procedures, ADAS sensor alignment, CAN-bus diagnostics) to the affected credential modules. This skills taxonomy allows targeted updates to micro-credentials without revising entire qualifications, reducing cost and accelerating responsiveness (OECD, 2025; Opetushallitus, 2025c).

Learner feedback and workplace outcomes should complement employer signals. While satisfaction data are routinely collected, renewal is better informed by performance indicators after training—e.g., first-time-fix rates on EV battery diagnosis, compliance incidents related to electrical safety, re-calibration success for ADAS. Embedding these metrics into micro-credential cycles supports continuous improvement and aligns with European guidance that emphasises clearly specified learning outcomes and reliable assessment for recognition (Council of the European Union, 2022; Cedefop, 2024).

Skills intelligence must underpin the process. The transition from OEF to a JOTPA-centred anticipation model—including Osaamistarvekompassi—promises annually refreshed competence clusters built from labour-market signals and AI-assisted analytics; however, providers report deployment gaps at occupational task level (Ministry of Education and Culture, 2024; OECD, 2025). A practical response is to couple provider refresh cycles (e.g., annual review windows) to these national outputs and to regional development frameworks, using taxonomy templates so that signals are translated into task-specific updates for diagnostic workflows and electrification procedures (South Savo Regional Council, 2025).

Finally, renewal mechanisms benefit from policy experimentation and funding alignment. Regionally anchored pilots can test sampling-based external moderation, taxonomy-driven update protocols and digital evidence workflows under workshop conditions, with attention to SME feasibility and downtime. EU Structural Funds and regional instruments can condition co-financing on EDC issuance (with ESCO descriptors, workload/level metadata) and compliance with moderation requirements, converting public support into accelerated adoption of interoperable, auditable renewal practices (Structural Funds Finland, 2025; European Commission, 2025; Opetushallitus, 2025c). In effect, content renewal becomes an agile, signal-driven process that balances system legitimacy (moderated assessment, digital verifiability, framework anchoring) with the speed required by electrification and software-centred servicing.

1.6.7 Alignment of micro-credentials with real-time or sectoral labour market trends

Aligning micro-credentials with labour-market signals requires a structured approach that balances **foundational knowledge**, **transferable skills**, and **specialised technical expertise**. OECD's analysis of VET and the green transition in Finland highlights this tripartite structure as critical for agility and resilience (OECD, 2025):

- **Units of Basic Competences:** Fundamental skills such as mathematics, Finnish/Swedish language, and digital literacy, which underpin all sectors and roles. These correspond to common units in vocational qualifications and ensure learners can adapt across contexts.
- **Units of Broader Professional Competences:** Cross-sectoral skills—problem-solving, teamwork, customer communication, and sustainability awareness—that provide versatility and support employability in dynamic labour markets.
- **Units of Specific Occupational Competences:** Specialised skills tied to particular technologies or regulatory requirements, such as high-voltage isolation, battery diagnostics, ADAS calibration, and secure connected diagnostics.

Micro-credentials are most effective when designed to complement this layered architecture rather than replace it. They should certify **specific occupational competences** while interoperating with broader qualification frameworks, ensuring that learners retain foundational and transversal skills. This approach mitigates the risk—emphasised by employers—that short courses bypass essential basics and create fragmented competence profiles (AutoCredify, 2025; Autoalan keskusliitto, 2025).

National policy frameworks acknowledge these alignment challenges. The Ministry of Education and Culture's draft reference model for small learning units and the Digivisio 2030 initiative aim to standardise micro-credential design and embed digital verifiability, supporting portability across providers and regions (Ministry of Education and Culture, 2024; Digivisio 2030, 2025). Opetushallitus guidance on Europass and European Digital Credentials further reinforces this trajectory by specifying metadata requirements—learning outcomes, workload, level descriptors, and ESCO skill tags—that enable machine-readable comparison and trust (Opetushallitus, 2025c; European Commission, 2025).

Labour-market intelligence confirms the urgency of this alignment. Employer data (CQ Systems, 2025) and European foresight (AUTOCOVE 2.0, 2024) consistently highlight accelerating demand for electrification, diagnostics, and digitalisation competences. Yet current micro-credential provision does not systematically reflect these priorities: while EV safety modules exist, coverage of ADAS calibration and secure diagnostics remains limited. Closing this gap requires **signal-driven design**, where outputs from JOTPA's Osaamistarvekompassi, OEM technical bulletins, and regulatory updates feed directly into modular content refresh cycles (OECD, 2025; Ministry of Education and Culture, 2024).

Embedding this responsiveness into governance structures calls for **policy experimentation**. Pilots could test taxonomybased mapping of occupational competences to microcredential modules, coupled with annual review windows linked to national anticipation outputs and regional development frameworks. Funding instruments—such as EU Structural Funds—can condition support on compliance with interoperability standards (EDC issuance, ESCO tagging) and moderated assessment, ensuring that agility does not compromise legitimacy (Council of the European Union, 2022; Structural Funds Finland, 2025).

1.7 Challenges, opportunities and recommendations

The analysis across Chapters 5 and 6 shows a persistent tension between the agility required to respond to fast-moving electrification and software-centred service processes, and the legitimacy embedded in Finland's competence-based VET architecture. Multi-year curriculum review cycles struggle to keep pace with OEM updates and evolving safety standards, while short courses outside the formal system often lack externally validated

assessment and interoperable digital credentialing, limiting portability and trust. SMEs face acute cost and capacity constraints, and employer engagement hinges on clear benefits such as compliance with statutory requirements and recognisability in recruitment and progression. These conditions point to a governance task: embed micro-credentials within an architecture that combines rapid, signal-driven content renewal with moderated assessment, digital verifiability and framework anchoring, so that responsiveness does not compromise quality assurance, equity or portability (OECD, 2025; Council of the European Union, 2022; Opetushallitus, 2025c; European Commission, 2025).

1.7.1 Provider Perspective and Strategic Choices

From the provider perspective, the choice is not whether micro-credentials should replace qualifications, but whether they can complement them in a way that preserves the integrity of three-year programmes while enabling rapid specialisation. Interviews confirm that most VET institutions continue to prioritise full qualifications and qualification units, reflecting strong quality assurance traditions and equity goals. This orientation remains valid: foundational competence in mechanics, basic electrics, diagnostic thinking and work-readiness must remain the core of initial VET. At the same time, providers face mounting pressure to respond to employer signals in high-voltage safety, ADAS calibration and secure diagnostics, which evolve at a cadence that conventional review cycles cannot match (AutoCredify, 2025; OECD, 2025).

Engagement with micro-credentials offers tangible advantages. It allows providers to serve adult learners and SMEs with short, targeted upskilling; it aligns with Finland's modular, competence-based architecture; and it opens access to funding streams designed for continuous learning, provided that delivery complies with moderated assessment and digital verifiability requirements. The Service Centre for Continuous Learning and Employment (JOTPA) has been established precisely to bridge labour-market signals and supply, funding short training aligned with emerging needs and coordinating anticipation outputs through Osaamistarvekompassi. Coupling provider refresh windows to these outputs, and issuing credentials as European Digital Credentials with ESCO descriptors and—where feasible—NQF/EQF references, positions VET institutions within an interoperable ecosystem while safeguarding trust (JOTPA, 2025; Ministry of Education and Culture, 2024; European Commission, 2025; Opetushallitus, 2025c).

Providers nevertheless have rational hesitations. Designing credible micro-credentials requires new capacities in modularisation, outcome-based assessment and digital issuance; repeating employer validation at high frequency can be costly; and staff time is scarce in small colleges. Models forward should therefore be lightweight and feasible. A taxonomy-driven approach can map occupationally specific technology and regulatory competences to discrete modules, allowing targeted updates when standards or OEM bulletins change without full curriculum rewrites. External moderation can be organised through periodic, sampling-based review of assessment artefacts rather than continuous third-party presence. Digital evidence workflows—short videos, diagnostic logs, structured checklists—can be captured in situ and sealed into EDCs, reducing administrative burden while raising comparability. Within this design, micro-credentials become strategic instruments: they protect foundational core learning in initial VET and provide governed, auditable specialisation pathways in work (OECD, 2025; Council of the European Union, 2022; Opetushallitus, 2025c).

1.7.2 Funding and Access: Collective Agreements as a Lever

Cost remains the immediate barrier to adoption for SMEs and individual learners. While qualification units in initial VET are tuition-free, short modules delivered as continuing education are typically fee-based; employers report

difficulty investing beyond mandatory compliance training given EV tooling costs and tight operating margins. Learners likewise face out-of-pocket expenses when modules sit below qualification-unit scope. Addressing these disparities requires moving beyond ad hoc project finance to durable co-investment arrangements that embed rights and resources within labour-market governance (OECD, 2025; AutoCredify, 2025; CQ Systems, 2025).

Sectoral collective agreements are a promising lever. In Finland, some industries already include training entitlements and co-financing provisions, though coverage is uneven compared to Denmark. For automotive mechanics, adapting collective agreements to earmark funds for modular upskilling would create predictable resources for providers and learners, particularly if contributions are linked to micro-credentials that meet agreed quality criteria—externally moderated assessment, EDC issuance with ESCO tagging, and framework referencing where applicable. JOTPA instruments can complement this by funding delivery for working-age adults and conditioning support on interoperability and moderated assessment, while EU Structural Funds and regional programmes can co-finance regional pilots and scaling. Aligning these streams converts public and social-partner investment into accelerated adoption of auditable, portable micro-credentials, rather than fragmenting support across short-term projects (JOTPA, 2025; Structural Funds Finland, 2025; Ministry of Education and Culture, 2024; European Commission, 2025).

Operationalising this alignment is a practical task. Providers can open annual review windows tied to anticipation outputs; regional authorities can specify eligibility conditions that require digital issuance and moderation; social partners can define priority competence areas and employer co-payments within collective agreements; and communication campaigns can clarify that European Digital Credentials differ from informal certificates by embedding machine-readable learning outcomes, workload/level descriptors and verification metadata. In this way, funding architecture and governance mechanisms reinforce each other, making access more equitable while ensuring that agility does not erode legitimacy (Council of the European Union, 2022; Opetushallitus, 2025c; OECD, 2025).

1.7.3 Challenges in Assessment and Trust for Micro-Credentials

Assessment is the decisive variable that determines whether micro-credentials function as professional guarantees or remain locality-bound tokens of attendance. In safety-critical contexts—high-voltage isolation, battery interventions, live-work protocols—employers require demonstrable capability aligned with risk categories and organisational responsibilities codified in SFS 6002:2025. Provider-generated multiple-choice tests and unmoderated practicals are insufficient to deliver the comparability and auditability that portability and compliance demand (SFS, 2025; Autoalan keskusliitto, 2025; OECD, 2025).

A way forward builds on Finland's tripartite governance tradition while drawing lessons from Nordic validation practices. Working life committees and sector bodies can be tasked with setting occupationally specific assessment standards for micro-credentials, co-designing task-based rubrics that reflect real workshop activities and safety requirements. External moderation can proceed through periodic audits of sampled evidence rather than continuous external presence, using structured criteria agreed at sector level. Digital evidence—short video demonstrations of prescribed tasks, anonymised diagnostic logs and safety checklists—can be attached to each credential, which is then issued as an EDC with embedded learning outcomes, workload, level and ESCO descriptors. Employers thereby gain immediate, machine-readable verification of origin, authenticity and content, while learners retain

wallet-based control over their records (Council of the European Union, 2022; European Commission, 2025; Opetushallitus, 2025c).

Embedding this assessment model also supports recognition of prior learning. Workplace artefacts can substitute for parts of a pathway only when they meet the same performance criteria and moderation standards as provider-generated assessments, protecting minimum thresholds and ensuring that stackability is governed progression rather than accumulation. Funding and anticipation instruments can reinforce adoption: co-financing eligibility can require moderation and EDC issuance, while provider refresh cycles can be tied to JOTPA's Osaamistarvekompassi so that new OEM procedures or standards updates trigger adjustments to learning outcomes and task specifications. In effect, employer involvement becomes an institutional asset for quality assurance, and assessment governance reconciles agility with legitimacy in ways that are feasible for SMEs and regional providers (JOTPA, 2025; OECD, 2025; SFS, 2025).

1.8 Conclusion and Pilot Implementation

Micro-credentials will deliver value in Finland's automotive sector when they operate as governed, portable specialisations that complement foundational VET, rather than as standalone short courses. The pathway is clear: anchor design in occupationally specific taxonomies; refresh content through signal-driven triggers aligned to JOTPA's anticipation outputs and standards/OEM notices; secure comparability through externally moderated, task-based assessment with digital evidence; and issue credentials as European Digital Credentials with transparent metadata and, where feasible, NQF/EQF references. Align collective agreements, JOTPA instruments and EU Structural Funds behind these requirements so that financing and governance jointly scale adoption. In doing so, Finland can reconcile agility with legitimacy, enabling rapid upskilling for electrification and digitalisation while safeguarding quality, equity and portability for learners and employers alike (Council of the European Union, 2022; European Commission, 2025; JOTPA, 2025; OECD, 2025).

Pilot Implementation under WP5–6

As part of the AutoCredify project's policy experimentation work package, Finland will implement a single stakeholder-driven pilot in South Savo to test these principles in practice. The pilot will build on teacher-led module plans outlined in Table 1 and focus on a learning pathway for high-voltage safety and advanced diagnostics. Activities will include co-design of task-based assessments aligned with SFS 6002 risk categories, external moderation through sampling-based audits by qualified assessors, and issuance of credentials as European Digital Credentials with embedded ESCO descriptors and workload/level metadata. Annual review windows will be linked to JOTPA's Osaamistarvekompassi signals and OEM technical bulletins to ensure agile content updates without full curriculum rewrites.

Monitoring and KPIs:

- Number of teachers and VET stakeholders involved in pilot design and delivery
- Moderation cycle time (days from assessment to audit)
- Employer acceptance rate (credentials recognised in recruitment/compliance)
- Credential verification success (EDC authenticity checks)
- Learner participation (target: at least 10% women)

- Completion-to-deployment lag (days from enrolment to credential issuance)

Findings will feed into the project's Blueprint and MCs Online Academy, supporting EU-wide scalability and transferability.



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1.10 Annexes

ANNEXE 3.1. Policy framework datasheet template (inspired in OECD, 2023)

Item	Item type
• Country	Finland
• Type	Policy initiative to support collaborative efforts to standardise MC desings
• Policy initiative name	National framework for small competence units DRAFT (Pienten osaamiskokonaisuuksien kansallinen viitekehys)
• Type of Leading organisation	Ministry
• Leading organisation name	Ministry of Education and Culture (Opetus- ja kulttuuriministeriö, OKM)
• Launch year	2024 DRAFT, to be published after pilot –based development
• Policy implementation level	Under development
• Duration/Length	1-59 ECTS
• Level	Exact EQF level depends on the individual micro-credential
• Inclusion in NQF	No
• Reference to industry and social relevance	Yes
• Reference to stackability and portability	Yes
• Providers that operate under the legislation/guideline	<ul style="list-style-type: none"> • Public university or higher education institutions • Vocational education and training (VET) providers • Private training organizations • Employer or industry associations • Professional body or licensing authority • Other (higher education institutions' continuing learning units, cooperation platforms such as Opin.fi)

ANNEXE 3.2. Identification of key aspects in the development of approach to micro-credentials

The development of a strong micro-credential ecosystem in Finland is closely linked to reforms of qualification requirements and sustained cooperation with industry stakeholders. Current reforms in vocational education aim to increase flexibility by enabling qualification units to be smaller in scope and by expanding opportunities to combine units across different qualifications. These changes support more modular and responsive skills development aligned with labour market needs.

However, revising national qualification requirements is a long-term process that typically takes several years. While slow, this process provides a stable foundation for system-wide integration of competencies and supports the recognition of skills across qualifications. In parallel, Finnish vocational education providers engage in close and systematic cooperation with employers and sector organisations to map skills needs and align training provision accordingly. This collaboration contributes to up-to-date competence development, improved employability, and reduced skills mismatches (OECD 2025; Opetushallitus 2025a).

Purpose of the analysis is to identify key significant aspects in the development of approach to micro-credentials at system-level policy and legislation (national or regional, if applicable)

Dimension	Indicators / Guiding Questions
<p>0. Strategy</p>	<p>The Finnish National Agency for Education has introduced increased flexibility and learner choice across most vocational and specialist qualification requirements. Revised qualification requirements are being implemented gradually and are expected to enter fully into force by 2027. The primary objective of these reforms is to respond more effectively to changing skills needs in working life and society (Opetushallitus 2025a).</p> <p>Vocational upper secondary qualifications, as well as vocational and specialist qualifications, are structured around units based on work processes, task entities, and sector-specific competences. The revised requirements expand opportunities for individual choice by enabling learners to complete units or combinations of units according to their personal skills needs and career goals (Eperusteet 2025a; Eperusteet 2025b; Eperusteet 2025c).</p>
<p>1. Involvement of stakeholders</p>	<p>Vocational education providers are encouraged to include a broader and more diverse range of qualification units and their combinations in their training provision. This approach is further supported by a revised funding model for vocational education, which will enter into force in 2026. Under this model, funding is increasingly linked to the completion of individual units rather than only full qualifications, thereby strengthening incentives for modular provision (Ministry of Education and Culture 2025b).</p> <p>Local qualification units play an important role in addressing sector-specific, regional, and emerging skills needs, including those arising from rapid changes in the operating environment. All vocational and specialist qualifications may also include units from other qualifications and, where applicable, higher education studies. Finnish VET providers maintain close collaboration with employers and industry organisations to identify skills needs, align curricula with labour market demand, and support workforce development (Autoalan keskusliitto 2025; OECD 2025).</p>

2. Inclusion of MCs in the NQF	In the Finnish vocational education system, micro-credentials are not formally recognised as independent qualifications within the National Qualifications Framework (NQF). To ensure recognition and comparability, micro-credentials must therefore be based on officially defined qualification units or their combinations. This linkage enables acquired competences to be positioned within the NQF and the European Qualifications Framework (EQF), supporting transparency and portability (Opetushallitus 2020; Council of the European Union 2022)..
3. Learning outcomes	At present, learning outcomes in Finnish vocational education are clearly defined at the level of qualification units. Smaller learning entities below the level of a qualification unit have not yet been systematically defined as independent learning units with clearly articulated learning outcomes. This limits the formalisation of micro-credentials that are smaller than existing qualification units and creates challenges for consistent implementation and recognition (Brauer 2023; Ministry of Education and Culture 2024).
4. Recognition of prior learning	Recognition and validation of prior learning in Finland are well established at the level of qualification units. Learners may demonstrate and have their prior competences recognised through competence demonstrations and assessment processes. However, there is currently no formal framework for recognising and validating learning that is smaller in scope than a qualification unit. This represents a structural limitation for the development of micro-credentials that are not directly embedded in qualification units (Opetushallitus 2025b).
5. Quality	Quality assurance in Finnish vocational education is coordinated by the Finnish National Agency for Education. Education providers are responsible for the quality of qualifications, training provision, and continuous quality improvement. Working life committees contribute to quality by supporting the implementation of competence demonstrations and skills assessment. At the national level, the Finnish National Agency for Education acts as the Quality Assurance National Reference Point (NRP) and cooperates with the European EQAVET network and other national reference points to ensure consistency and transparency (Opetushallitus 2020; Cedefop 2024).
6. Supplement to micro-credentials	Education providers have considerable autonomy in deciding how micro-credentials and small competence modules are delivered and certified. Providers may use their own digital learning environments as well as national or shared platforms that support the creation and awarding of digital skills badges. This flexibility enables experimentation but also contributes to fragmentation in delivery and visibility (Opetushallitus 2025c; Digivisio 2030 2025).
7. Transparency	At present, there are no national or regional plans in Finland to establish a single, unified platform for the visibility and comparison of micro-credentials. As a result, information on available micro-credentials remains fragmented across providers and platforms, making it difficult for learners and employers to identify suitable learning opportunities and understand their value (Nordic Network for Life-long Learning 2024; Brauer 2023).

8. Support to implementation	Small competence modules and micro-credentials can be developed using providers' own resources or through project-based funding. For example, national initiatives supporting continuous learning provide funding for piloting and developing small competence modules. While project funding supports innovation, reliance on temporary funding limits long-term sustainability and scale-up (Ministry of Education and Culture 2024; OECD 2025).
9. Learning pathway	Currently, learning pathways for accumulating competences smaller than qualification units are not systematically developed in Finland. There are no established mechanisms for tracking, stacking, or combining smaller learning units over time into larger, recognised competence profiles. This limits the potential of micro-credentials to support coherent lifelong learning pathways and progressive skill development (Council of the European Union 2022; Cedefop 2022).



ANNEX 3.3. Main stakeholders of the micro-credentials ecosystem

Main stakeholders active in MC development, implementation, recognition and quality assurance in the automotive/maintenance and repair sector illustrated in Figure 1.1 and related text details below.

Figure 1.1 Key stakeholders of a micro-credentials ecosystem in Finland.



Made with  Napkin

Related education and training providers in Finland:

VET education providers: Samiedu, Esedu, Omnia, Keuda, Tredu, Gradia, Riveria, Sakky, Vamia, Salpaus, OSAO, Live, Fai, Jami, KAO, Eduko, Novida, Sampo, YSAO. They focus on providing VET Vocational Qualification in Vehicle Technology/ Vocational Qualification in Automotive Industry

Higher education providers: Metropolia University of Applied Sciences, Tampere University of Applied Sciences, (TAMK), Turku University of Applied Sciences (TUAS), Oulu University of Applied Sciences (Oamk)

OEM Training Academies: Examples: Toyota Academy, Volkswagen Group Training, Mercedes-Benz Training Finland (Focus: Brand-specific technical training, EV systems, ADAS calibration, diagnostics.)

Private Training Companies:

Examples: *Prodiags*, *Diagno Oy*. Focus: Online, in-class and blended learning modules for diagnostics, electrical safety (SFS 6002), and advanced automotive technologies.

Industry Associations and Sector Bodies:

Autoalan Keskusliitto (AKL) – Finnish Central Organisation for Motor Trades and Repairs. Role: Provides sector-specific training and certification programs.

Autoalan Tiedotuskeskus – Automotive Information Centre. Role: Disseminates industry knowledge and supports competence development.

Adult Education Centres (Aikuiskoulutuskeskukset). Some offer short courses in automotive basics and maintenance for career changers.

Public Authorities

Ministry of Education and Culture (OKM)

Finnish National Agency for Education (Opetushallitus)

Finnish Education Evaluation Centre (Karvi)

Regional ELY Centres (Centres for Economic Development, Transport and the Environment)

Regional Council of South Savo (and other regional councils in other regions)

Broader environment

Autoalan Keskusliitto (AKL) – Finnish Central Organisation for Motor Trades and Repairs

Autoalan Tiedotuskeskus – Automotive Information Centre

Finland's automotive industry comprises approximately 15,009 companies operating under TOL 45 (motor vehicle trade and repair) according to Statistics Finland 2025a.

Learners No statistics on MC learners available yet.

Adult learners – Upskilling technicians and career changers. In South Savo, there are 1,700 unemployed individuals without vocational qualifications, of which 30% are under 30 years old. Funding pressures in vocational education increase the importance of smaller competence units for these groups (TEM 2025:34).

Young learners – VET students enrolled in automotive qualifications (e.g., Vocational Qualification in Vehicle Technology).

Disadvantaged learners – The number of jobseekers without vocational qualifications in South Savo is high based in TEM2025:34). These statistics include those with only general upper secondary education without vocational qualifications (300 in South Savo).

ANNEX 3.4. Skills intelligence data

Labour Market Intelligence focuses on workforce trends, skills needs, wages, and future employment outlooks in Finland. Other related publications may be reviewed from list of references.

Item	Item type
• Title	2025 Skills forecast Finland
• Type of publication	Report
• Publisher	Cedefop, European Centre for the Development of Vocational Education
• Type of organization	Close-ended (Research institution)
• Year	2025
• Geographical scope	Close-ended (National)
• Content	The Cedefop 2025 Skills Forecast for Finland provides labour market intelligence on employment, unemployment, and earnings outlooks; skills needs and mismatches; skills gaps; and current and future skill demands. It covers both green and digital transitions and includes projections for occupational trends, qualification levels, and recruitment pressures across sectors, including automotive manufacturing, repair, and maintenance.
• Sector	Close-ended (Other: Skills in general including vehicle Manufacturing, repair&Maintenance)
• Transition	Close-ended (Green and Digital both)
• Methodology	Close-ended (<i>Mixed</i>): Methodology combines macroeconomic modelling with employer surveys and expert consultations to validate sectoral projections
• Data sources	Close-ended; Labour market data, Online vacancies, Employers' survey, Interviews, Focus groups
• Consulted stakeholders	Policymakers; Sectoral Organisations
• Key gaps	Open-ended (3 bullet points): <ul style="list-style-type: none"> • Limited integration of labour market intelligence into training systems, slowing adaptation to technological change. • Lack of detailed competence mapping for emerging technologies (EV systems, ADAS calibration, cybersecurity). • Fragmented data on wages and regional employment outlooks for automotive maintenance roles.
• Recommendations	Open-ended (3 bullet points):

	<ul style="list-style-type: none"> • Strengthen integration of labour market intelligence into curriculum design and modular learning units. • Enhance granularity of sector-specific forecasts to include emerging automotive technologies. • Improve accessibility and coordination of labour market data to support evidence-based policy and micro-credential development.
<ul style="list-style-type: none"> • Micro-credential references 	No; The report does not explicitly use the term 'micro-credential' but highlights modular and flexible learning pathways as critical for addressing skills shortages.
<ul style="list-style-type: none"> • Micro-credential role 	While the report does not explicitly mention micro-credentials, it highlights the importance of modular and flexible learning pathways to address skills shortages and technological change. Micro-credentials can play a critical role in supporting rapid upskilling and reskilling, particularly for medium-level technical occupations such as automotive technicians. They help address recruitment difficulties and skills gaps caused by electrification, digitalisation, and the green transition.

2 SPAIN

Deliverable information

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Responsible Project Partner:	FGB	Contributing Project Partners:	Navarra region

Document data:	File name:	AutoCredify WP3 Country Report Spain		
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For more information visit project's [website](#).

2.1 Executive summary

This country report examines the state of play, effectiveness and future potential of micro-credentials in the vehicle repair and maintenance sector in Spain, with particular attention to the skills transition associated with hybrid, electric and connected vehicles. The analysis situates micro-credentials within Spain's broader education and training ecosystem, which is characterised by institutional complexity, high decentralisation and ongoing regulatory reform. While Spain has made initial progress in aligning parts of its system with the EU Recommendation on micro-credentials, implementation remains uneven, fragmented and at an early stage of maturity.

From a policy perspective, the Spanish landscape is marked by the coexistence of multiple, closely related concepts—such as micro-credentials, accreditations of partial competence and training specialisations—across three distinct subsystems: formal vocational education and training (VET), vocational training for employment, and higher education. This terminological and conceptual fragmentation undermines transparency and weakens the signalling value of micro-credentials for learners, employers and training providers. Although each subsystem serves different target groups, the boundaries between learning pathways become blurred in practice, adding complexity to an already crowded lifelong learning landscape of provision. At the same time, all three subsystems have undergone recent reforms that are still being implemented, limiting the availability of evidence on outcomes and effectiveness. The university system appears to be the most advanced in deploying micro-credentials, particularly through the use of Europass-compatible digital certification, offering valuable lessons that could inform wider system-level coherence if appropriate coordination mechanisms were established.

Governance and stakeholder engagement represent both a strength and a challenge for micro-credential implementation. Across national and regional authorities, public employment services, social partners and training providers, there is broad consensus on the potential value of micro-credentials as a flexible and responsive instrument to address emerging skills needs. Stakeholders widely agree that micro-credentials should complement, rather than replace, existing qualifications and can play a role in widening participation, particularly among employed workers and vulnerable groups. Importantly, the absence of a dedicated micro-credential regulatory framework is not widely perceived as a critical barrier, given that many core governance functions—such as provider accreditation, quality assurance and data reporting—already exist within the vocational training for employment system, notably through the Catalogue of Training Specialities. However, Spain's highly decentralised governance structure means that effective implementation will depend heavily on regional capacities and priorities, increasing the risk of uneven territorial development and variable quality in the absence of strong coordination and common standards.

In the automotive sector, and especially in hybrid, electric and connected vehicle repair and maintenance, existing cooperation platforms linked to the Strategic Project for Economic Recovery and Transformation for the Electric and Connected Vehicle (PERTE-VEC) provide a solid institutional basis for dialogue between ministries, regional authorities, employers and trade unions. Nevertheless, the translation of strategic consensus into concrete micro-credential pathways remains limited. Downstream actors, such as independent repair workshops, are not always fully integrated into these governance structures, despite their central role in servicing and maintaining electric vehicles. As a result, sector-specific leadership and coordinated regional strategies are still insufficient to drive large-scale, coherent deployment of micro-credentials aligned with occupational standards.

The mapping of existing training provision reveals a highly atomised and fragmented offer. Within formal VET, electric and hybrid vehicle-related programmes are structured, competency-based and linked to national qualification standards, but they are narrow in scope, recent in origin and characterised by relatively low enrolment. Although some autonomous communities have introduced modular programmes that could function as micro-

credentials, these are not explicitly framed or communicated as such. Outside formal VET, the landscape is dominated by heterogeneous short courses delivered through the vocational training for employment system, private providers and original equipment manufacturers. While these offerings often respond quickly to market demand, they frequently lack clearly articulated learning outcomes, robust assessment of practical and transversal skills, digital certification and transparent recognition mechanisms. The widespread use of online or blended delivery formats further complicates the assessment of hands-on competences that are critical in vehicle repair and maintenance. As a result, many micro-credential-like courses remain isolated, non-stackable and weakly recognised.

Spain benefits from a strong and diversified skills-intelligence ecosystem, which consistently highlights acute shortages of qualified vehicle mechanics and the growing importance of competences in electromechanics, high-voltage systems, batteries, electronics, digital diagnostics and connected vehicle technologies. However, the translation of this intelligence into effective, scalable training responses remains partial. Monitoring of training outcomes and labour-market relevance is uneven, and feedback loops between skills intelligence, training design and certification are not yet sufficiently developed. Micro-credentials could serve as a flexible bridge between identified skills needs and rapid training provision, but only if better integrated into strategic planning and quality assurance frameworks.

Overall, the effectiveness of micro-credential implementation in Spain's vehicle repair and maintenance sector is best described as emerging but limited. The foundational elements—policy alignment with EU principles, supportive stakeholder attitudes, existing governance structures and modular training provision—are largely in place. However, fragmentation, weak coordination across subsystems and regions, inconsistent quality assurance, and limited recognition by employers currently constrain impact. To move from potential to practice, Spain will need to strengthen coherence across its lifelong learning ecosystem, clarify the role and value of micro-credentials, enhance assessment and digital certification practices, and ensure sustained sector-specific leadership. Under these conditions, micro-credentials could evolve into a meaningful and trusted instrument for supporting upskilling, reskilling and the green and digital transition of the automotive sector.

2.2 Policy framework

Analysing the conditions for deploying microcredentials in Spain requires examining the three training subsystems— Higher Education, Vocational Education and Training (VET), and Training for Employment—each of which falls under the responsibility of a different ministry. Higher Education is overseen by the Ministry of Science, Innovation and Universities; VET is governed by the Ministry of Education and VET; and the Training for Employment subsystem is managed by the Ministry of Labour and Social Economy, whose actions are expected to complement those of the other two ministries.

Each training subsystem is governed by its own regulatory framework, which has recently undergone reform. As these regulatory developments are still in the early stages of implementation, it is difficult to fully assess their impact.

Between 2022 and 2023 the Parliament has approved the reform of three major laws regulating the organisation and integration of VET, Employment and the University System.

- Organic Law 3/2022, of 31 March, on the organisation and integration of VET
- Law 3/2023, of 28 February, on Employment
- Organic Law 2/2023, of 22 March, on the University System

Once these laws were approved, the Spanish Government used Royal Decrees to develop and implement them in practice, setting out detailed rules and procedures needed for their application. Three Royal Decrees are particularly relevant to understand the present and future deployment of microcredentials:

- Royal Decree 822/2021, of 28 September, on the organisation and quality assurance of university education
- Royal Decree 659/2023, of 18 July, on the organisation of the VET system, and RD 658/2024, which amends it
- Royal Decree 438/2024, of 30 April, on the Common Portfolio of Services of the National Employment System

The remainder of the section outlines the key regulatory developments in the University, VET, and Training for Employment subsystems, and concludes with the main insights drawn from this analysis.

2.2.1 Microcredentials in the University System

In the university subsystem, Royal Decree 822/2021 authorises universities to issue microcredentials certifying learning outcomes linked to continuing education activities of up to 15 ECTS, provided they do not overlap with qualifications offered in Initial VET.

The implementation of microcredentials is supported by the University Microcredential Development Plan, a measure within the Recovery, Transformation and Resilience Plan (PRTR) approved in 2021. Its objectives include delivering at least 60,000 microcredentials (each under 15 ECTS) and publishing an evaluation report on their provision.

Key characteristics of University microcredentials

- Fewer than 15 ECTS (1 ECTS = 25 hours of student work)
- Between 1 and 5 learning outcomes
- Target group: adults aged 25–64, with or without prior qualifications, employed or unemployed
- Stackable
- Digitally certified (Europass-compatible)
- Quality assurance system incorporated

The total budget amounts to €48.5 million, distributed across the 17 autonomous communities. Public universities receive the funding, which covers 70% of participant costs, with additional grants for vulnerable or low-income learners.

Among the plan's objectives is the adoption and standardisation of digital certification mechanisms for learning outcomes through the Europass Digital Wallet, ensuring security, authenticity, international portability, and easy sharing with employers and institutions. The 23 universities participating in the CertiDigital project are expected to adopt digital certification by January 2024, with the remaining universities targeted for January 2025, benefiting from the tools developed within the project.

The plan identifies three main risks:

- Mismatch between supply and real needs: Funding may encourage universities to base microcredentials on existing strengths rather than market or learner demand, leading to a supply-driven offer.
- Superficial unbundling instead of genuine redesign: Simply breaking degrees into smaller units without adapting content, pedagogy, or teaching profiles would fail to meet the needs of adult professionals seeking specialised, flexible learning.
- Failure to leverage collaboration and scale: Working in isolation may cause universities to miss opportunities for partnerships with other institutions, industry, or international networks, reducing efficiency, value, and reach.

As these initiatives are still at a very early stage of development, it will take time to determine whether these risks actually materialise.

2.2.2 Microaccreditations in the Government-regulated VET System

The Organic Law 3/2022 on Vocational Education and Training (VET) introduced an integrated and highly flexible system that brings together vocational learning, competence recognition, and career guidance under a single framework. In 2020, the newly created Ministry of Education and Vocational Training assumed full responsibility for organising the Spanish VET system, centralising functions that were previously split across education and labour ministries. It now oversees VET policy and sets the core curriculum for both initial VET diploma programmes and professional certificates.

The VET offer is organised into progressive training pathways based on five cumulative grades (A to E) : from short micro-training units or partial competence accreditations (Grade A) to full VET programmes and advanced specialisation courses (Grades D and E).

Grade	Partial and stackable	Dual nature
A. Partial Skills Validation	Yes	No
B. Certificate of Competence	Yes	No
C. Professional Certificate	Yes	Yes
D. VET degree (Basic, Intermediate and Higher)	No	Yes
E. Specialisation Courses	No	In some cases

Grades A, B and C are partial and stackable within the wider VET structure, meaning they can be accumulated towards higher-level VET offers (Grades B, C, or D respectively) when their training components are fully or partly included in those programmes. These pathways are mapped across three competence levels (1, 2, and 3), which indicate increasing levels of knowledge, autonomy, responsibility, and task complexity. The law reinforces the dual nature of VET by requiring workplace training in programmes leading to professional certificates (Grade C) and VET diplomas (Grade D), and in some cases for Grade E specialisations. To obtain any qualification, learners must successfully complete all associated modules.

The Catálogo Nacional de Ofertas de Formación Profesional [National Catalogue of Vocational Training Offers] is the key instrument of Spain's VET system, listing all officially recognised and creditable training opportunities, from Grade A microcredentials to Grade E specialisation courses. The current VET offer includes 969 professional

certificates, 184 VET qualifications (28 at basic level, 64 at intermediate, 92 at advanced), and 29 specialisation courses, all of which can be formally recognised and accumulated within the system ¹

National Catalogue of Professional Competence Standards	Modular Catalogue of Vocational Training	National Catalogue of Vocational Training offers
It includes the competency standards that serve as the basis for designing the training programs of the Vocational Training system and for the processes of competency accreditation.	It includes the professional modules of the Vocational Training system. This catalog is useful for designing training pathways.	It includes all the training offers of the Vocational Training System organized by Grades (A, B, C, D and E), Levels (1 basic, 2 intermediate and 3 higher) and Professional Families.

Source: TodoFP

The modular structure of the formal Vocational Training system is connected with the Catálogo Nacional de Estándares de Competencias Profesionales [National Catalogue of Professional Competence Standards] (CNECP). The CNECP structures the professional competence standards identified across the Spanish productive system and defines the knowledge, skills, and quality requirements needed for effective professional practice. These standards provide the basis for official recognition, accreditation, and training design.

Managed by the National Institute of Qualifications (INCUAL), the CNECP currently comprises 2,618 professional competence standards grouped into 28 professional families. These competence standards constitute the basic unit for

- the design of government-regulated VET training
- the recognition and accreditation of professional competences acquired through work experience or through non-formal and informal learning pathways.

Each Professional Competence Standard provides a detailed description of the expected performance in a given occupation and includes at least:

- Identification data: official name, professional family, level, and unique alphanumeric code.
- Professional competence: the knowledge and skills required to perform professional activities in line with production and employment needs.
- Elements of competence (EC): descriptions of the tasks and activities that represent competent performance, along with quality indicators (IC) specifying the expected level of execution in real work environments.
- Professional context: indicative information on the occupational field, key job roles, relevant sectors, and general specifications on tools, equipment, and production means.

By the same token competency certificates (B-level) is linked to a professional module within the Catálogo Modular de Formación Profesional [Modular Catalogue of Vocational Training] and to a competency standard from the

¹https://sede.sepe.gob.es/FOET_CATALOGO_EEFF_SEDE/flows/buscarEspecialidadesNA?execucion=e1s1

CNECP. Each module is, in turn, associated with a professional competency standard. Every one of these standards includes an evidence guide for the assessment of professional competence.

Partial accreditations of competence (Grade A), also known as microaccreditations, represent the elementary training offer within the system and are primarily aimed at workers who need to update or expand their professional competences. Partial competence accreditations derived from the fragmentation of professional modules are only valid and certifiable within the VET System itself.

In addition to the regulatory framework, the national government has launched significant state-level investment of 24.9 M€ to support the expansion of Grade A microaccreditations. This call includes 81 short training programmes aligned with the needs of productive sectors engaged in the various Hubs and Strategic Projects (PERTEs), covering fields such as electronics, transport, and the audiovisual industry, as well as larger training modules in renewable energy, construction, agriculture, and the environment. However, no microaccreditations related to electric vehicles were included in this call.

2.2.3 Microcredential-like trainings in the Training for Employment subsystem.

As previously mentioned, Training for Employment is expected to complement the University and VET subsystems. In 2020, a redistribution of responsibilities in the area of Vocational Training for Employment was introduced. As result, professional certificates (Grade C) now fall under the remit of the Ministry of Education and Vocational Training whereas the Ministry of Labour and Social Economy retains competence, among others, over company-led training aimed at improving workers' skills, as well as training programmes for employed workers included in the Catalogue of Training Specialities [Catálogo de Especialidades Formativas] of the State Public Employment Service (SEPE).

The Catalogue of Training Specialities stands out as a key tool within the Vocational Training System for Employment in the workplace to respond swiftly to the training demands of emerging sectors and occupations in Spain. This instrument is managed by the Spanish Public Employment Service [Servicio Público de Empleo] and serves as a transparent and accessible tool for disseminating information on Spain's integrated vocational training system. According to a majority of organizations engaged in the Vocational Training System for Employment, the Catalogue of Training Specialities is seen as an effective reference for adopting the European approach for micro-credentials. (PAE Executive Summary, 2023).

The Catalogue applies nationwide and organizes all training offered within the framework of the National Employment System, covering both formal and non-formal programs. Formal training refers to specialisations aimed at obtaining professional certificates [Certificados Profesionales] I], while the remaining specialities constitute non-formal training that is not linked to the National Qualifications Framework [Catálogo Nacional de Estándares de Competencias Profesionales (CNECP)

The Catalogue provides a common reference for training institutions designing and planning vocational training initiatives for both employed and unemployed individuals, excluding company-specific in-house training programs.

The main objectives of the Catalogue are

- to ensure that training offerings are aligned with the needs of the labor market
- to support the monitoring and continuous improvement of training quality, and
- to serve as a tool for Public Employment Services in providing career guidance and designing personalized employment pathways.

The State Public Employment Service, in coordination with the Autonomous Communities, is responsible for the ongoing development of the Catalogue. This process is informed by continuous monitoring and identification of training needs through the Occupations Observatory [Observatorio de las Ocupaciones], in collaboration with social partners, other ministerial departments, and relevant experts in each field.

Public or private training providers intending to deliver courses listed in the Catalogue must be registered in the National Registry of Training Providers [Registro Estatal de Entidades de Formación]. Training providers should demonstrate compliance with the requirements outlined in each training programme included in the Catalogue they intend to deliver. The deadline for resolving the accreditation procedure is six months and is the responsibility of regional Public Employment Services. This registration ensures public access to information regarding the courses they offer, the quality assurance procedures they implement, and the documentation required to monitor their training activities.

The training courses linked to the catalogue are completely free of charge for both employed and unemployed people. Users can search for specialties, pathways and training providers using the online search tools provided by the State Public Employment Service.

Each training offer included in the Catalogue identifies a set of competencies, technical content, and work-related activities, along with the transversal skills needed for effective professional performance. Training programmes can be easily downloaded and adhere to the same structure that includes a precise description of the level of qualification, trainer and trainee requirements, learning goals, modules and contents, duration, space and equipment requirements and related occupations (8-digit national occupation classification [CNO-11])

Updates to the Catalogue follow a structured approach. All training programmes undergo a periodic review at least every five years. This systematic updating process ensures that the Catalogue remains aligned with the dynamic demands of the labor market and the productive system. Since 2018, the Catalogue has added 26 courses related to electric and/or connected vehicles (See Good Practice for more information). For all the above, the Catalogue is seen as an "ideal instrument to host and identify micro-credentials" (González-Palazuela, 2023)².

In this sense, a recent regulatory development³ points to the integration of microcredentials for lifelong learning and employability within the Training for Employment framework., Real Decreto 438/2024, dated April 30, 2024, introducing provisions related to the Law 3/2023 on Employment, refers explicitly to the integration of microcredentials for lifelong learning and employability in line with the the EU's Recommendation of June 16, 2022. Accordingly, microcredentials are seen as a tool to provide targeted knowledge, skills, and competencies to meet labor market needs and help vulnerable groups, such as youth, low-skilled workers, and individuals in microenterprises or SMEs, adapt to a rapidly changing labour market. Moreover, microcredentials offer a flexible way to overcome barriers to traditional training, particularly for those facing geographical or personal challenges. They also support the continuous professional development of technical personnel in public employment services, contributing to the overall improvement of workforce skills and employability.

Microcredentials will be developed through social dialogue between employers, workers, and other stakeholders. Unlike formal qualifications, they will not be linked to the National Catalogue of Competency Standards and will fall

² <https://www.sepe.es/HomeSepe/es/que-es-observatorio/Hipatia/cuadernos-mercado-trabajo/revista-cuadernos-mercado-trabajo/detalle-articulo.html?detail=/revista/Cuarta-revoluci-n-industrial-y-su-impacto-en-el-mercado-laboral-y-la-formaci-n/microcredencialesunenfoqueeuropeoparaelaprendizajepermanenteylaempleabilidad>

³ https://www.boe.es/diario_boe/txt.php?id=BOE-A-2024-8710

outside the formal VET system. A wide range of public and private providers, including companies, professional associations, universities, and local authorities, will issue these credentials, ensuring they are tailored to specific sectoral and regional needs.

Given the fact training specialisations are not linked to the Catalogue of Competency Standards and therefore, they are not formally recognised, microcredentials may help in raising the profile of training specialisations among potential beneficiaries and its signalling function among employers. The issuance of microcredential upon completion could also enhance its use as evidence in the recognition of prior learning processes and bridge the gap between the non-formal and formal VET system.

2.2.4 Regional development: Galicia's Emerging Framework for Labour-Oriented Microcredentials

Galicia is preparing to become the first Spanish autonomous community to establish a regulatory framework for labour-oriented microcredentials through the Proyecto de Decreto/2025, which will create the Marco Gallego de Microcredenciales para el Trabajo [Galician Framework of Microcredentials for Employment] (MGMT). Although not yet officially published, the initiative represents an innovative policy response aimed at addressing skills gaps not covered by existing formal learning provision.

A central principle of the framework is its strong orientation to labour-market needs. Microcredentials must align with current and emerging demands of the productive sectors, specifically those not addressed by university microcredentials or by formal VET qualifications—namely the accredited A and B levels and the State Public Employment Service's Catalogue of Training Specialities. This ensures that MGMT microcredentials target unmet skill shortages and support economic and social development in the region.

The MGMT sets out governance, design, and recognition mechanisms that link learning outcomes to the ESCO classification and promote collaboration among employers, social partners, training providers, and the regional employment authority. Microcredentials are envisaged as short, flexible, non-formal training experiences (10–100 hours) for employed and unemployed workers, issued as verifiable digital credentials to facilitate employability and continuous professional development.

Quality requirements cover curriculum design, delivery, and assessment—whether theoretical, practical, or combined—with mandatory final evaluation and annually reviewed criteria. Competences must be periodically updated to maintain labour-market relevance. Issuing entities and training agents will operate under clearly defined roles and will be subject to both internal and accredited external quality assurance aligned with UNE standards.

The decree also introduces a modern digital architecture, including a central Digital Microcredentials Portal, the Active Repository of Microcredentials for Work in Galicia (REMITGAL), and the Personal Training Account, all designed to ensure transparency, interoperability, and integration with regional and national employment systems.

Overall, the MGMT sets out a coherent governance model, a clear assessment framework, robust quality-assurance mechanisms, and an integrated system of digital credentialing tools. Together, these elements position Galicia as a pioneer in market-responsive microcredential policy and lay the foundation for a broader transformation of its lifelong-learning and skills ecosystem. However, as the decree has not yet been operationalised, its ultimate effectiveness is still uncertain, and careful monitoring of its implementation will be crucial to understanding how the framework evolves in practice.

2.2.5 Conclusions

The coexistence of different yet closely related terms—such as “microcredentials,” “microaccreditations/accreditations of partial competence,” and “training specialisations”—used to describe distinct concepts across the three sub-systems risks undermining clarity for potential beneficiaries, employers and other stakeholders (González Gago, 2023). This terminological fragmentation complicates the understanding of the purpose, scope, and value of each type of credential, particularly for users navigating an already complex landscape.

Although the three sub-systems serve different target groups, this differentiation becomes blurred when considering microcredentials and microcredential-like offerings. Their overlapping functions add yet another layer of complexity to an emerging and still immature ecosystem, where boundaries between learning pathways are not always clearly perceived or communicated.

As noted earlier, each sub-system operates under its own regulatory framework, all of which have recently undergone reforms and remain in early stages of implementation. This limits the ability to fully assess their impact. The university system appears to be further advanced in the deployment of microcredentials and the use of Europass-based digital certification. Its experience illustrates the potential benefits of cross-pollination and the exchange of lessons learned across the three sub-systems, provided that structured communication channels and coordination mechanisms are established.

Looking ahead, regional policy innovations—such as the emerging Galician Framework of Microcredentials for Work—demonstrate the potential of territorially driven approaches to address skill gaps and strengthen labour-market relevance. While still untested, such initiatives may serve as laboratories for experimentation, offering valuable insights for national policy development and for enhancing coherence across Spain’s broader lifelong-learning ecosystem.

2.3 Key stakeholders and cooperation ecosystem

2.3.1 Understanding and perceptions of micro-credentials by key stakeholders

The most relevant national source on this question is the *Diagnostic Assessment of the opportunities and capacities of the Spanish Training System for Employment to integrate the European micro-credentials approach* (Consejo General del Sistema Nacional de Empleo, 2023)⁴. This qualitative assessment involved national bodies (SEPE, FUNDAE), regional governments, and the main employer and trade-union organisations.

According to the assessment, all actors in the vocational training for employment system have a broadly positive view of the European micro-credential approach. They see micro-credentials as a flexible and rapid tool to respond to emerging skill needs in companies. Stakeholders emphasise that micro-credentials should complement, not replace, existing formal training provision, and can help increase participation among employed and unemployed workers, as well as vulnerable groups.

The absence of a specific regulatory framework does not imply starting from scratch. Most organisations consider the existing Catalogue of Training Specialities a suitable starting point, since it already includes a wide range of short, non-accredited courses delivered across Spain by numerous training providers. However, given the high level

⁴ https://www.sistemanacionalempleo.es/HomeSne/dam/sne/pdf/20230613_Resumen-Ejecutivo.pdf

of decentralisation of employment policies, effective implementation will require strong inter-institutional coordination and additional financial, technical and human resources.

Stakeholders to be involved include: the Ministry of Labour and Social Economy; Ministry of Education and VET; Ministry of Universities; the Public Employment Service and regional employment services; trade unions; employer organisations; professional associations; National Reference Centres; training providers; companies; the National Institute of Qualifications, and other authorities responsible for the regulation of training provision, regulated professions and professional accreditation.

2.3.2 Distribution of roles in the micro-credential governance system

The evaluation proposes that implementation should be led by the National Public Employment Service (SEPE), working in close cooperation with regional employment services and drawing on established procedures linked to the Catalogue of Training Specialities (for example, accreditation and registration of training providers). It also recommends establishing a common register of learning outcomes to ensure traceability and recognition of skills.

Importantly, most governance functions already exist under current regulation (Order TMS/283/2019). According to Article 5 of Order TMS/283/2019 regulating the Catalogue of Training Specialities, responsibility is already distributed as follows:

Indicative distribution of functions

Function	Main responsible actors
Coordination	SEPE, in cooperation with regional employment services
Identification of training needs	SEPE and the <i>Observatorio de las Ocupaciones</i> , in cooperation with regional services, employers, trade unions and learners
Design, delivery and assessment	Accredited Training Providers registered in the National Training Provider Registry
Accreditation and authorisation	SEPE and/or regional Public Employment Services
Data exchange, reporting and impact assessment	SEPE in cooperation with Autonomous Communities

Together, these existing arrangements provide a clear governance structure which can be adapted for the implementation of micro-credentials with limited additional regulatory change. Therefore, in most cases the approach to micro-credentials could replicate the existing governance model, which already defines the roles and responsibilities of the main actors in developing, updating and managing training provision. This represents a strong foundation for moving towards a micro-credential-based approach.

Given the high degree of decentralisation of education and employment policies in Spain, the final decision-making, design and implementation of micro-credentials will largely depend on governance arrangements at regional level. This implies active involvement of regional departments responsible for employment and vocational training, together with sector organisations, manufacturers, vehicle repair associations and trade unions. In practice, effective deployment in the automotive sector—especially for hybrid and electric vehicle maintenance—will require coordinated regional strategies and cooperation with employers and training providers operating in each autonomous community.

2.3.3 Specific issues for the hybrid and electric vehicle repair and maintenance sector

For the electric and connected vehicle sector, the relevant public bodies are those involved across the entire value chain of the Electric and Connected Vehicle (VEC). At national level, a useful reference point are the commissions,

working groups and collective bodies linked to the PERTE for the Electric and Connected Vehicle, in which the main automotive associations (ANFAC, FACONAUTO, SERNAUTO, GANVAM, AEDIVE, ANESDOR) and the most representative trade unions (CCOO, UGT-FICA and USO) take part.

The national Alliance for the Electric and Connected Vehicle brings together the inter-ministerial working group and the “Mesa de la Automoción”, where the main unions, employer organisations and regional authorities participate. These bodies already provide an institutional platform where the potential of micro-credentials for upskilling within the sector could be debated and coordinated.

Achieving recognition of the added value of micro-credentials will require targeted awareness-raising among all companies and workers across the value chain. In Spain, the automotive value chain is represented by several associations that cover different segments:

- ANFAC – vehicle and truck manufacturers;
- SERNAUTO – component suppliers;
- FACONAUTO and GANVAM – distribution, sales and after-sales services;
- AEDIVE – electrification, charging infrastructure and sustainable mobility;
- ANESDOR – the two-wheeler segment (motorcycles, bicycles, including electric mobility).

Although not formally represented in the “Mesa de la Automoción”, CETRAA, which represents independent repair and maintenance workshops, is a crucial actor in the downstream part of the electric vehicle value chain, particularly for hybrid and electric vehicle servicing, repairs and technological adaptation.

Taken together, these stakeholders cover all stages from design and manufacturing through to distribution, after-sales services and repair. They would therefore be key interlocutors in identifying skill needs and promoting micro-credentials in the transition to electric and connected mobility.

2.3.4 Conclusion

In conclusion, the analysis of key stakeholders shows a broadly favourable environment for the future introduction of micro-credentials in Spain, supported by shared understanding of their potential as a flexible and responsive training instrument. National and regional actors within the vocational training for employment system largely agree that micro-credentials can complement existing provision, help address emerging skills needs, and widen participation among diverse learner groups. Importantly, stakeholders do not perceive the absence of a dedicated regulatory framework as a major barrier, given that many of the required governance functions, quality assurance mechanisms and provider accreditation procedures already exist within the current Catalogue of Training Specialities. This institutional readiness provides a solid foundation for piloting and scaling micro-credentials without the need for far-reaching regulatory reform.

At the same time, effective implementation will depend on strong coordination across Spain’s highly decentralised governance landscape and on the active engagement of sectoral actors. In the automotive sector—and particularly in hybrid, electric and connected vehicle repair and maintenance—existing cooperation platforms linked to the PERTE for the Electric and Connected Vehicle offer a valuable entry point for dialogue and coordination. However, translating strategic consensus into operational micro-credentials will require targeted awareness-raising, clear articulation of added value for companies and workers, and regionally coordinated approaches involving training providers, employers, trade unions and professional associations, including those representing independent

workshops. Overall, while governance structures and stakeholder ecosystems are largely in place, sustained cooperation and sector-specific leadership will be critical to ensure that micro-credentials become a recognised, trusted and widely used tool for upskilling in the transition to electric and connected mobility.

2.4 MC offerings and learning pathways

First and foremost, it is important to reiterate that micro-credentials are not yet in widespread use in Spain, particularly within the automotive sector. As noted in previous sections, some recent policy developments in the fields of education and employment are aligned with the EU Recommendation; however, key stakeholders remain largely unfamiliar with the concept.

Against this backdrop, this section summarises the findings of the mapping exercise on the existing provision of micro-credentials and micro-credential-like training and accreditation in the vehicle repair and maintenance sector, with a specific focus on electric and connected vehicles.

The definition and standard descriptive elements of micro-credentials set out in Annex I of the European Recommendation (EC, 2022) have guided the analysis. Particular attention has been paid to the nature of the micro-credentials, their providers, target groups, thematic focus, learning outcomes, duration, and the procedures for assessment, recognition, and accreditation.

2.4.1 Formal VET system: EV/HV-related microaccreditations

Within the extensive catalogue of VET training programmes, the specific offer related to hybrid and electric vehicles remains limited. As of today, it consists of only two specialisation courses (grade E):

- Specialization Course in Maintenance of Hybrid and Electric Vehicles ⁵ (650 hours)
- Specialization Course in Maintenance and Safety of Systems in Hybrid and Electric Vehicle Systems⁶ (650 hours)

To understand the modular structure of the system, we will use the Specialization Course in Maintenance of Hybrid and Electric Vehicles (650 hours) as an example. In this case, the E-level qualification is divided into four B-level qualifications.

Grado B	Description	Hours
TMV_B_5060	Safety in Hybrid and Electric Vehicles	75
TMV_B_5061	Propulsion Systems in Hybrid and Electric Vehicles	140
TMV_B_5062	High Voltage Electrical Systems, Batteries, and Charging	135
TMV_B_5063	Power Transmission and Thermal Management	115

⁵<https://todofp.es/que-estudiar/familias-profesionales/transporte-mantenimiento-vehiculos/ce-mantenimiento-vehiculos-electricos-hibridos.html>

⁶<https://todofp.es/que-estudiar/familias-profesionales/transporte-mantenimiento-vehiculos/ce-mantenimiento-seguridad-hibridos-electricos.html>

Each B-level qualification, in turn, is further subdivided into A-level qualifications. These A-level qualifications represent the foundational training offerings within the system and are primarily designed for professionals who need to update or expand their competencies. In the case of the Safety in Hybrid and Electric Vehicles qualification, it is broken down into six A-level modules.

Grade B	Grade A	Description	Hours
TMV_B_5060 (75 hours)	TMV_A_5060_01RA	Safety Regulations for Vehicle Maintenance Workshops	15
	TMV_A_5060_02RA	Effects of a Voltage Discharge in the Handling of Hybrid and Electric Vehicles	15
	TMV_A_5060_03RA	Delimitation of High Voltage Work Area and Vehicle Identification	10
	TMV_A_5060_04RA	Placement of Safety Elements and Verification of Voltage Absence	10
	TMV_A_5060_05RA	Disconnection Verification and Signaling with Condensation Discs	15
	TMV_A_5060_06RA	Occupational Risk Prevention and Environmental Protection Standards to Prevent Workplace Hazards in Electric and Hybrid Vehicles	10

At the same time, each competency certificate (B-level) is linked to a professional module within the Modular Catalogue of Vocational Training and to a competency standard from the CNECP.

Code	Module Name	Competence Standard
5060	Safety in Hybrid and Electric Vehicles	ECP2648_2
5061	Propulsion Systems in Hybrid and Electric Vehicles	ECP2649_2
5062	High Voltage Electrical Systems, Batteries, and Charging	ECP2650_2
5063	Power Transmission and Thermal Management	ECP2651_2

Each module is, in turn, associated with a professional competency standard. Every one of these standards includes an evidence guide for the assessment of professional competence.

Level	Code	Description
2	ECP2648_2	Prepare the maintenance workstation for hybrid and electric vehicles.
2	ECP2649_2	Maintain propulsion systems in hybrid and electric vehicles.
2	ECP2650_2	Maintain high-voltage electrical systems, batteries, and charging systems in hybrid and electric vehicles.
2	ECP2651_2	Maintain power transmission systems and thermal management in hybrid and electric vehicles.

Currently specialisation courses are offered by over 30 public I-VET providers located in 11 regions but the enrolment figures remain modest.

Specialisation course (Grade E)	VET providers	Regions	Enrolment 2024-2025
Maintenance of Hybrid and Electric Vehicles	33	11	282
Safety and maintenance in Hybrid and Electric Vehicle Systems	36	11	324

Although the offer of these specialisation courses is still limited and relatively recent, some autonomous communities had already incorporated training modules or complementary training units on electric vehicles into Grade D programmes, responding both to regional needs and to the requirements of the automotive sector. The following two examples illustrate this development.

As early as 2009, Navarre incorporated two modules into the curriculum of its Automotive VET programmes, requiring second-year students to complete between 50 and 70 hours of training on electric vehicles. Aimed at

addressing the priorities set out in the 2009 Automotive Sector Competitiveness Plan for Navarre—which included, among its objectives, a shift towards more sustainable vehicle production (hybrid, electric and low-emission models) and the strengthening of VET provision to meet related upskilling and reskilling needs—the regional Department of Education introduced two compulsory modules on hybrid, electric and hydrogen vehicles into both Intermediate and Higher VET programmes in the automotive field.

More recently, in Catalonia, the Intermediate VET qualification (Grade D) in Electromechanics of Motor Vehicles includes a 12-hour training unit covering the operation, components and key features of hybrid and electric vehicles. This unit was developed by the Centre de Recursos del Vehicle Elèctric (Electric Vehicle Resource Centre).

2.4.2 VET for Employment: Catálogo de especialidades formativas⁷

The Catalogue search tool was used to identify training programmes related to the green and digital transitions within the vehicle maintenance and repair sector, focusing specifically on two vocational areas: Transport and Vehicle Maintenance, and Information and Communications Technology.

Search results show that since 2018, the Catalogue has incorporated 26 courses related to electric and/or connected vehicles. Most offerings focus on electric or hybrid vehicles (84.6%), while a smaller proportion addresses connected vehicles (15.4%). The majority correspond to qualification level 2 (65.4%), although courses are available across all levels from 1 to 5. Over half of these specialisations (56.7%) have been published within the last two years. Delivery is predominantly face-to-face (84.6%), with the remainder offered in blended formats. Course duration ranges from 8 to 575 hours (average: 99; median: 40), with half falling between 25.5 and 90 hours.

This variability is also reflected in the number of accredited providers offering these specialisations. On average, each Electric/Connected Vehicle training specialisation is delivered by 24 approved entities (range: 0–106), although the majority (53.8%) are offered by ten or fewer providers nationwide. It is important to note that the inclusion of a qualification in the Catalogue does not guarantee its consistent or immediate availability across all regions. Furthermore, a relatively small group of providers delivers a large share of the courses, highlighting the need to engage these organisations to gather insights on micro-credentials and their potential to complement and strengthen existing training provision.

In Navarre, only 5 of the 26 training specialisations (19.2%) are delivered, by two providers: the Navarre Association of Vehicle Repair Workshops (ANTRV) and Alma Formación. ANTRV has developed a training programme entitled Electromechanical Vehicle Maintenance (271 hours), which incorporates two relevant specialisations—TMVG0004 Hybrid Vehicle Maintenance and TMVG08 Advanced Driver Assistance Systems (ADAS)—alongside other Catalogue offerings. This illustrates the potential of the Catalogue framework to support stackable learning pathways

The general guidelines for Catalogue programmes stipulate that assessment must combine theoretical and practical components, conducted systematically and continuously throughout each module as well as at the end of the course. An initial diagnostic assessment may be used to determine participants' baseline knowledge. Evaluations should employ methods and instruments suited to the intended learning outcomes, ensuring reliability and validity. The primary assessment tool is a multiple-choice test, and final results are reported as either "Pass" or "Fail." While most programmes include practical elements and specify the tools and equipment required for workshop activities,

⁷ For more detailed information see Case Study.

reliance on multiple-choice testing as the main assessment method is insufficient for evaluating practical or transversal skills.

2.4.3 Short trainings offered by private providers

The current offer of short courses on electric, hybrid and connected vehicles is staggering in its volume yet highly atomised, with information that is often patchy, uneven in quality and dispersed across multiple websites and providers. Thus, the information included in this section does not represent a comprehensive or systematic mapping of provision; rather, it offers a snapshot intended to give a glimpse into the fragmented landscape of EV- and CV-related short training courses that can be identified through desk research and online searches. As such, it should be read as illustrative rather than exhaustive.

The results of online searches reveal a rapidly expanding and heterogeneous market of short-duration learning offers delivered by a wide range of actors, including certification bodies (e.g. TÜV Rheinland), technical inspection and safety organisations (Eurocontrol/APAVE), OEM-related academies (Valeo Tech Academy), private training centres (MIAC, CESVIMAP), technology centres (Eurecat Academy), sectoral associations (CETRAA), and specialised cybersecurity providers (Cybentia/Eurocybar).

Most programmes target employed workers, although a number of short courses offered by OEMs and other organisations are specifically designed for VET teachers. For example, Volkswagen has provided training for IVET teachers responsible for delivering the new Specialisation Courses on HV/EV, hosted at VW facilities and certified by the Regional Department of Education of Castilla–La Mancha. Likewise, a group of VET teachers in Navarre has completed the three qualification levels of the TÜV Rheinland Safety Technician in High-Voltage Vehicles certification, aligned with the German DGUV 209-093 standard.

Most courses focus on electric and hybrid vehicle technologies, particularly high-voltage safety, battery systems, propulsion, diagnostics and ADAS, while a smaller but growing subset addresses connected-vehicle and cybersecurity requirements. A strong emphasis is placed on safety-related competencies—especially high-voltage handling—often structured in progressive levels (e.g. VE1–VE3 or TÜV DGUV 209-093 levels 1–4), which suggests the existence of de facto learning pathways, even if these are not formally recognised as stackable or linked to national qualification frameworks.

Course duration varies significantly, ranging from very short introductions of 2–4 hours to more substantial programmes of 24–40 hours, and in some cases longer hybrid formats of up to 36 hours. Delivery modes are equally diverse, with offerings available online, face-to-face, hybrid, or in combined formats, reflecting an effort to accommodate employed professionals and companies' operational constraints.

In terms of cost, these short courses typically range between approximately €300 and €600, depending on duration, level of specialisation and provider, although prices are not always transparently published. In most cases, however, participation can be fully or partially subsidised through FUNDAE (Fundación Estatal para la Formación en el Empleo), the Spanish State Foundation for Employment Training. FUNDAE manages public funds dedicated to continuing vocational training and supports both companies and workers through different financing mechanisms, including company training credits and individual training permits. Companies accumulate an annual training credit, calculated as a percentage of their contributions to the vocational training levy paid through social security, which can be used to offset the cost of approved training activities for their employees. This system significantly lowers financial barriers to participation and helps explain the proliferation of short, market-oriented courses, although it does not in itself guarantee the quality, recognition or labour-market value of the resulting certificates.

An important share of the courses—particularly those addressing basic concepts, regulatory updates and cybersecurity—are offered fully online, while others combine online and face-to-face components or are delivered exclusively in person. This widespread use of online formats increases accessibility for employed workers and geographically dispersed learners, but it also raises important questions regarding the assessment of practical competencies. For technical areas such as high-voltage safety, battery handling, diagnostics and repair, the reliance on online provision makes it difficult to ensure robust, practice-based assessment, which is essential for validating occupational competence in safety-critical tasks.

Notably, only a very small number of programmes in the table are explicitly labelled as micro-credentials, all of them offered by the Campus FPCAT–UPC de la Movilidad Sostenible and delivered offline, with defined durations of 20 to 40 hours. These stand in contrast to the majority of short courses, which issue provider-specific certificates without clear reference to learning outcomes, ECTS equivalence, or formal recognition mechanisms.

Overall, the picture attests to the dynamism and the fragmentation of the current training landscape: while supply is rich and responsive to emerging technological needs, it remains weakly standardised and unevenly connected to formal VET or micro-credential frameworks. This reinforces the need for caution in interpreting the table as representative, while underlining the significant potential for structuring, quality-assuring and better integrating such short courses into coherent upskilling pathways.

2.4.4 Conclusions

In conclusion, the mapping exercise confirms that while Spain has made initial progress in aligning elements of its VET system with the EU Recommendation on micro-credentials, their actual deployment—particularly in the automotive repair and maintenance sector—remains limited and fragmented. Within the formal VET system, EV/HV-related provision is structured, regulated and competency-based, with clear links to national qualification standards and assessment procedures. However, the offer is narrow, recent, and characterised by modest enrolment figures, suggesting that it has yet to reach scale or respond fully to emerging skills demand. Although some autonomous communities have demonstrated early responsiveness by embedding EV-related content into Grade D programmes, these initiatives remain uneven and are not explicitly framed as micro-credentials, despite their modularity and potential for stackability.

Beyond formal VET, the landscape is dominated by heterogeneous short training programmes delivered through the VET-for-employment system and private providers. While the Catalogue of Training Specialisations offers a potentially flexible framework that could support micro-credential development, current practices fall short in terms of learning-outcome clarity, robust assessment of practical and transversal skills, digital certification, and transparent recognition mechanisms. Private and OEM-led training responds more directly to market needs but remains largely disconnected from formal qualification systems and recognised micro-credential standards. Overall, the findings point to a significant opportunity: Spain already possesses many of the structural building blocks required for micro-credentials, but greater coherence, stakeholder awareness, quality assurance, and alignment with European standards are needed for micro-credentials to become a meaningful and trusted tool for upskilling and reskilling in the transition to electric and connected mobility.

2.5 Effectiveness of micro-credential implementation

Overall, the effectiveness of micro-credential implementation in Spain must be understood as uneven and still emergent, shaped by a combination of favourable structural conditions and significant operational constraints. From a policy perspective, recent reforms across the education, vocational training and employment subsystems have created space for more flexible, modular and short-duration learning offers that are broadly aligned with the European approach to micro-credentials. However, the coexistence of different terms—micro-credentials, partial competence accreditations and training specialisations—across these subsystems weakens policy coherence and limits the capacity of micro-credentials to function as a clear and recognisable signal of skills. This lack of terminological and conceptual clarity reduces their effectiveness for learners and employers, who often struggle to understand the relative value, portability and progression opportunities associated with each type of credential.

Institutionally, Spain appears well positioned to implement micro-credentials more effectively, as many of the core governance and quality assurance functions are already embedded in existing frameworks, particularly within the vocational training for employment system. The Catalogue of Training Specialities provides an operational infrastructure for short, modular learning, including provider accreditation, assessment requirements and data reporting. Nevertheless, the effectiveness of this framework in practice is constrained by limited coordination across subsystems and levels of governance, as well as by the early stage of implementation of recent regulatory reforms. The more advanced experience of the university system in issuing Europass-based digital micro-credentials demonstrates that effective implementation is feasible, but also highlights the need for structured mechanisms to transfer lessons learned and to ensure interoperability across the broader lifelong learning ecosystem.

At the level of stakeholders and cooperation, the generally positive perception of micro-credentials constitutes a clear enabling factor for effective implementation. National and regional authorities, social partners and training providers recognise their potential to address rapidly evolving skill needs, particularly in sectors undergoing technological transformation such as automotive repair and maintenance. However, this shared strategic vision has yet to be translated into coordinated operational practices. Spain's highly decentralised governance structure means that the design, funding and delivery of micro-credentials will largely depend on regional priorities and capacities, increasing the risk of territorial disparities. In the absence of strong coordination and common quality benchmarks, micro-credentials may proliferate unevenly, limiting their overall credibility and labour-market impact.

The mapping of existing offerings further reveals that effectiveness is currently undermined by fragmentation and variable quality. Within formal VET, EV/HV-related provision is well structured and competency-based but narrow in scope, recent in origin and characterised by modest participation levels. Outside formal VET, short courses offered through the VET-for-employment system and by private providers respond more quickly to market demand but often lack clearly articulated learning outcomes, robust assessment of practical and transversal skills, digital certification and explicit links to recognised qualification frameworks. As a result, many micro-credential-like offers remain isolated, non-stackable and weakly recognised, reducing their capacity to support meaningful upskilling pathways or career progression.

In the specific context of hybrid, electric and connected vehicle repair and maintenance, these limitations significantly affect the potential impact of micro-credentials. While sectoral platforms linked to the PERTE for the Electric and Connected Vehicle provide a strong basis for cooperation, their role in shaping concrete training solutions remains underdeveloped. Effective implementation will require clearer articulation of occupational skill needs across the value chain, stronger involvement of downstream actors such as independent workshops, and closer alignment between training content and professional standards. Without sustained sector-specific leadership, micro-credentials risk remaining peripheral to mainstream training strategies in the automotive sector.

In sum, the effectiveness of micro-credential implementation in Spain is currently more potential than reality. The necessary building blocks—policy alignment with EU principles, supportive stakeholder attitudes, existing governance structures and modular training provision—are largely in place. However, real effectiveness will depend on addressing fragmentation, strengthening coordination across subsystems and regions, improving quality assurance and assessment practices, and enhancing the visibility and recognition of micro-credentials for both learners and employers. Only under these conditions can micro-credentials evolve from experimental or complementary instruments into an effective and trusted tool for supporting lifelong learning and the green and digital transition of the automotive sector.

2.6 Emerging skills needs and gaps

By way of scene-setting, Spain has a wide range of labour-market information and intelligence sources. National and regional governments, sectoral organisations and other social partners contribute in different ways to identify emerging labour and skills shortages and gaps. Although these efforts do not necessarily share the same objectives or follow consistent conceptual or methodological approaches, together they contribute to a growing and increasingly rich body of knowledge.

2.6.1 Sources of Skills Intelligence at national level

The report Empleo y transición ecológica. Yacimientos de empleo, transformación laboral y retos formativos en los sectores relacionados con el cambio climático y la biodiversidad en España (FUNDAE, 2023) [Employment and Ecological Transition: Employment Opportunities, Labour Transformation and Training Challenges in Sectors Linked to Climate Change and Biodiversity in Spain] outlines major changes expected in the Spanish automotive sector between 2021 and 2030. Electrification and climate goals will reshape the entire value chain—from original equipment manufacturing to battery, hydrogen, and smart-vehicle components—driving demand for new skills in digital connectivity, microelectronics, charging systems, R&D, digitalisation, and circular-economy processes.

The report highlights the need for significant workforce reskilling and the emergence of new specialised profiles, such as CO₂-emission analysts and calibration experts. It also notes that related service sectors—workshops, service stations, and charging-infrastructure operators—will face parallel changes in job roles and skill requirements.

Aligned with the EU's Sustainable and Smart Mobility Strategy, the study stresses the importance of a gender-inclusive transition. It calls for measures to attract more women into the sector, improve their representation at all professional levels, and promote equality initiatives that enable their full participation in emerging green-mobility occupations.

However, the key element for understanding Spain's skills intelligence system is the Observatorio de las Ocupaciones [Occupations Observatory] managed by the Servicio Público de Empleo Estatal [Spanish Public Employment Service] (henceforth, SEPE).

2.6.2 Observatorio de las ocupaciones [Occupations Observatory]

The SEPE Occupations Observatory functions as Spain's early indicator for shifts in labor market trends, pinpointing emerging occupations, skills and training needs. By merging administrative data analysis with feedback

from employers and specialists, it equips policymakers, educators, and businesses with the information needed to ready the workforce for upcoming challenges.

On a regular basis, the Occupations Observatory releases reports to provide users with comprehensive, up-to-date information, facilitate knowledge exchange, and offer valuable insights into labor market trends. In 2025 alone, the Occupations Observatory published three major reports that provide essential information for understanding labor market dynamics and guiding decisions across education, business, and policy.

- Tendencias del mercado de trabajo en España (2025) [Labor Market Trends in Spain]
- El ajuste de la oferta y la demanda de empleo en el mercado de trabajo (2025) [The Adjustment of Job Supply and Demand in the Labour Market]
- Informe de prospección y detección de necesidades formativas (2025) [Report on Prospecting and Identifying Training Needs]

The three reports offer a multifaceted view of Spain's labour market. Labour Market Trends in Spain analyzes the sectors with the strongest performance and growth potential, linking each to its most relevant occupations and identifying associated training needs, replacement demand, and supply–demand mismatches. The report highlights the Motor Vehicle and Motorcycle Sales and Repair sector as a notable example of stability and expansion, driven by factors such as vehicle ageing and the transition to electric mobility, yet constrained by persistent difficulties in recruiting vehicle mechanics and fitters.

The report The Adjustment of Job Supply and Demand in the Labor Market deepens this analysis by combining two complementary data sources: the Annual Labor Survey, which reveals which sectors are expanding or contracting, and the Survey on Mismatches, which identifies recruiting difficulties and the reasons behind. By integrating these perspectives, the report pinpoints occupations and economic activities with the most severe mismatches, confirming that the motor vehicle sales and repair sector ranks among those with the greatest hiring difficulties, largely due to shortages of candidates with adequate experience and technical skills.

Complementing these findings, the Report on the Prospection and Detection of Training Needs assesses skill gaps in hundreds of occupations nationwide, examining technical, digital, transversal, and language skills. Using strengthened quantitative methods and extensive employer input, it identifies the most critical training priorities and emerging skill areas, including those linked to digitalization and the green transition. The 2025 edition underscores the high demand for training among vehicle mechanics, particularly in electric vehicle technologies, which account for a significant share of the sector's identified needs.

The Observatorio de las Ocupaciones provides users with an online search tool⁸ that enables rapid consultation of training needs for specific occupations, either by name or by the four-digit CNO-11 code. The tool covers both technical-professional competencies and transversal skills. The online search also allows users to consult training needs at a regional level for specific occupations and economic activities⁹

Table. Key training needs related to electric vehicle in VET-related occupations (2025)

CNO-11	Profile	Key Training Needs Related to Electric Vehicles
7401	Motor Vehicle Mechanics and Fitters	Electromechanics: Hybrid and Electric Vehicles (9.3%) Hybrid and Electric Vehicle Maintenance (2.33%)

⁸<https://www.sepe.es/HomeSepe/que-es-observatorio/deteccion-necesidades-formativas/buscador-necesidades-formativas.html>

⁹<https://www.sepe.es/HomeSepe/que-es-observatorio/deteccion-necesidades-formativas/mapa-provincias-nnff.html>

The continuous monitoring of training needs informs the development and updating of another key element in the public skills intelligence system, the *Catálogo de Especialidades Formativas*, already described in the previous section of this report.

Sectoral organisations and social partners

Sectoral organisations and social partners also provide important skills-intelligence inputs at national level, notably through studies assessing labour implications of the transition to electric mobility. By way of example the *Asociación Empresarial para el Desarrollo e Impulso de la Movilidad Eléctrica (AEDIVE)*, which represents companies across the electric-mobility value chain, analysed the employment effects of replacing combustion engines with electric motors up to 2030. Using 2019 data as a baseline, the report *Transición hacia el Vehículo Eléctrico. Observatorio del empleo industrial (AEDIVE, 2022)*, anticipates a net reduction of around 29,000 jobs (8%) by 2030 but highlights substantial labour transfers across sectors and the need for large-scale reskilling schemes—estimated at 165,000 workers—to meet new technical and operational requirements. The report concludes job losses in the traditional automotive industry will be partly offset by job growth in energy production and charging-infrastructure industries but this will require coordinated action from public administrations, companies, and workers.

A complementary perspective is offered by *Fundación Primero de Mayo*, a research and training foundation of Spain's trade union *Comisiones Obreras (CCOO)*, specialising in labour-market analysis and social-policy research. Through a combination of desk research, surveys and interviews with sector experts, the report *Nuevos perfiles profesionales para una automoción eléctrica [New professional profiles for electric mobility] (Fundación Primero de Mayo, 2024)* puts the focus on emerging qualification needs and professional profiles expected to gain demand as electrification accelerates. The report also includes four case studies of major automotive plants, illustrating how transition dynamics unfold at regional level in the Basque Country (Mercedes Benz), Galicia and Aragón (Stellantis), and Navarra (Volkswagen).

The authors underscore the strategic role of microcredentials introduced under Spain's new VET law, noting their potential to support flexible, modular learning, facilitate reskilling, and strengthen ties between education providers, companies, and research institutions—though challenges remain regarding standardisation and recognition. This approach could draw on the pioneering work already underway in higher education, even if not specifically focused on the automotive sector.

Skills Intelligence Strategy for Higher Education and Microcredentials

The Ministry of Science, Innovation and Universities, in collaboration with the European Commission's DG Reform, is developing a national Skills Intelligence Strategy and a microcredentials framework to help universities anticipate labour-market needs, strengthen lifelong learning, and reinforce the alignment between higher education and employment.

The project advances across three main areas. First, a pilot will test one of the Strategy's proposed measures using tools from the forthcoming Skills Intelligence Kit. Second, drafting the Strategy involves building a model to identify priority skills within Spain's socio-economic context, co-creating microcredentials aligned with strategic objectives, producing recommendations and guidelines, and validating results through stakeholder workshops. Third, the Skills Intelligence Kit will provide universities with practical instruments—methodologies, analytical criteria, planning

cycles, templates, cooperation mechanisms, and examples—to support the design of relevant microcredentials and to share experiences through dedicated workshops.

Preliminary work has focused on: evaluating learner-centred microcredential initiatives relevant to workers and employers; benchmarking international skills-intelligence practices; and reviewing Spain's administrative tools and datasets for their potential contribution to skills analysis. Early findings presented at the end of 2024 indicate that only 27 of 90 universities (30%) currently offer microcredentials, amounting to 304 programmes. Sixteen of these institutions (59%) provide Europass-compatible digital certification, while just five (19%) include information on stackability or modularity. This suggests that although provision is expanding, the development of flexible and transparent learning pathways remains in an early phase.

2.6.3 Sources of Skills Intelligence at regional level

Spain's highly decentralised system places significant responsibility for education and employment policies in its autonomous communities. Although a full analysis of skills intelligence across all 17 regions lies beyond the scope of this report, two illustrative and recent examples are provided to highlight the types of initiatives developed by Regional Public Employment Services and Regional Educational Authorities.

ASTURIAS: Training needs in the transport and vehicle maintenance sector in Asturias (Servicio Público de Empleo del Principado de Asturias, 2025)

The Public Employment Service of Asturias (SEPEPA) has been carrying out sectoral studies on training needs since 2005. In 2024, one such study focused on the transport and vehicle maintenance sector, examining emerging skill requirements in light of technological and organisational change. The 2025 report identifies two major challenges: the growing presence of hybrid and electric vehicles and the increasing digitalisation of workshops, both of which significantly reshape the professional profile of mechanics. Companies highlighted training needs in diagnosis, safe handling, maintenance and repair of electric and hybrid vehicle systems—particularly batteries—as well as competencies in electricity, electronics and IT.

These findings feed directly into SEPEPA's annual process for determining eligible training specialties. Alongside the sector study results, SEPEPA consults regional business associations such as the Automobile Association of the Principality of Asturias (ASPA) to validate priorities. The resulting call for training subsidies specifies which specialties are eligible, their duration and level, and whether they are considered priority. For 2025–2026, the priority list clearly reflects the dual transition, with top-ranked courses centred on hybrid and electric vehicle technologies, high-voltage systems, batteries, and anti-pollution systems.

Training outcomes are monitored through the Public Employment Services Information System (SISPE), using indicators such as course completion, dropout due to hiring, dropout for other reasons, and job placement and Social Security affiliation at six and twelve months. However, job-placement indicators do not yet differentiate whether participants are employed in occupations linked to their training. At national level, these results feed into the Annual Plan for the Evaluation of Quality, Impact, Effectiveness and Efficiency of the Vocational Training for Employment System, though the most recent published data correspond to 2020–2021.

CATALONIA. Catalan Model for Researching Vocational Training and Qualification Needs¹⁰

¹⁰<https://fp.gencat.cat/ca/arees/Prospeccio-de-necessitats-de-formacio-i-qualificacio-professionals/index.html>

Catalonia has long benefited from a wide range of public and private initiatives analysing current and future training needs at sectoral and regional levels. However, there is broad consensus on the need for an integrated, dynamic system capable of bringing together this dispersed intelligence and providing coherent, forward-looking information on vocational-training and qualification needs—both in the present labour-market context and in future scenarios. In 2020, the Governing Committee of the Vocational Training and Qualification System of Catalonia (FPCAT System) adopted the general criteria for a unified Catalan Model for Researching Vocational Training and Qualification needs. The FPCAT Agency (Agència Pública de Formació i Qualificació Professionals de Catalunya) was tasked with developing this model across the whole Catalan administration. Training-needs foresight is conceived as the first step in planning the vocational training offer and is understood as a continuous process of analysing evolving labour-market demands, emerging professional profiles, and the effects of innovation on the productive system.

The cornerstone of the system is the General Foresight Report, published every four years, which guides the planning of all basic services of the FPCAT System (career guidance, initial VET, VET for employment, and recognition of prior learning). It provides general, sectoral, and territorial analyses of current and projected qualification needs and is structured into five key components:

- (a) diagnosis of VET demand and supply;
- (b) labour-market developments;
- (c) qualification-needs foresight;
- (d) future training scenarios; and
- (e) recommendations for service planning.

For each dimension, indicators, disaggregation levels, periodicity, and data sources are specified. The system also produces sectoral reports to deepen analysis in specific industries when significant change is detected, and territorial reports to capture local dynamics.

Sectoral studies follow mixed qualitative and quantitative methods—interviews, surveys, and documentary research—and examine sector characterisation, challenges, transformation policies, professional profiles, competency models, training adequacy, and recommendations. The competency model considers five axes: technology and automation; information management; polyvalence versus specialisation; technical versus soft skills; and autonomy versus dependency. Additionally, companies are consulted on recruitment practices, skill shortages, and in-company training strategies.

A dedicated online platform provides open access to all data, indicators, studies, and analytical tools related to vocational training and the FPCAT System. This includes data visualisations, reports produced by the FPCAT Agency, and materials from other labour-market actors, with the aim of facilitating access to evidence and disseminating the knowledge generated.

Automotive-sector insights were drawn from 47 interviews with representatives of the productive fabric. The findings highlight a need to strengthen training in electromechanics, electronics, data interpretation and analysis, problem-solving skills, and foreign languages. Stakeholders also call for expanding training provision in municipalities hosting automotive companies and for deeper public-private cooperation to ensure training aligns with sectoral needs. Greater investment in practical training resources is also emphasised. These results were further validated during the first in-person meeting of the sectoral councils held in October 2023 as part of the FPCAT Agency's 2023–2026 Prospective Conference.

2.6.4 Other sources of labour market intelligence

PERTE-VEC Plan for updating and anticipating the professional competencies

The Strategic Project for Recovery and Economic Transformation for the Development of Electric and Connected Vehicles (PERTE-VEC) included, among its enabling measures, the creation of a specific plan for updating and anticipating the professional competencies required by the sector. However, despite the planned timeline for its development between 2021 and 2023, no evidence of the plan's publication or implementation has been reported to date.

National Reference Centre for the Automotive Sector identification of skill and profile needs in the sector and subsectors of automotive repair

The Centro Público Integrado de Formación Profesional (CPIFP) Bajo Aragón, designated as the National Reference Centre for the Automotive Sector, is also expected to play a key role in aligning vocational training with industry needs. One of its strategic projects is the identification of skill and profile needs in the sector and subsectors of automotive repair. This process is carried out through a structured methodology that involves, first, identifying the key stakeholders to be consulted—such as other National Reference Centres, repair sector associations, educational institutions, and training departments from vehicle manufacturers' after-sales services. These actors then jointly discuss and prioritize the most pressing needs, leading to the development of a consolidated proposal on the skill requirements and professional profiles that future workers in the automotive repair sector should cover.

Hubs for Vocational Education and Training

In contrast to continuing VET sources, initial vocational education and training (IVET) generates labour market intelligence through the “Hubs for Vocational Education and Training”. Five sector-specific hubs—covering IT, aerospace, rail, green energy, and audiovisual industries—enable companies to participate in identifying training needs and updating the IVET offer. By continuously monitoring labour market occupations and competencies, the hubs support agile adjustments to training provision. Since 2019, this process has led to the publication of 44 Royal Decrees and 22 ministerial orders updating the IVET catalogue.

2.6.5 Conclusions

Spain benefits from a dense and increasingly sophisticated skills-intelligence ecosystem that brings together national observatories, sectoral organisations, social partners, higher education institutions and regional authorities. Taken collectively, these sources provide a consistent picture of the profound transformation underway in the automotive sector, driven by electrification, digitalisation and environmental objectives. Across national and regional analyses, there is strong convergence on the diagnosis of persistent recruitment difficulties, particularly for vehicle mechanics and related technical profiles, and on the urgency of upskilling and reskilling in areas such as electromechanics, high-voltage systems, batteries, electronics, digital diagnostics and connected-vehicle technologies. This shared evidence base represents a major asset for policy design, as it allows training priorities to be grounded in robust, regularly updated labour-market intelligence.

At the same time, the conclusions also point to structural challenges that limit the translation of this intelligence into effective and timely training responses. The multiplicity of actors, data sources and methodologies—while enriching analysis—can hinder coherence, comparability and strategic prioritisation, particularly in a highly decentralised system. Monitoring of outcomes, especially employment relevance and occupational matching after training, remains partial, and some planned initiatives, such as the PERTE-VEC competencies plan, have yet to materialise.

Overall, while Spain has a strong foundation for anticipating skill needs in electric and connected mobility, greater coordination across levels of governance, stronger feedback loops between intelligence and provision, and closer alignment with flexible training instruments such as micro-credentials will be essential to ensure that identified needs are translated into effective, scalable and labour-market-relevant learning opportunities.

2.7 Challenges, opportunities and recommendations

This section summarises the key issues emerging from the analysis of the current micro-credential landscape, highlighting system-level barriers, enabling factors and potential actions to strengthen implementation. The objective is to synthesise evidence for follow-up activities under WP4 (implementation) and WP5 (policy dialogue and innovation).

2.7.1 Challenges

Supply-side

On the supply side, several constraints limit the capacity of training providers to engage in micro-credential development. These include limited incentives for public training institutions, lack of staff capabilities to address emerging skill needs, and the rigidity of existing formal VET structures. Other obstacles relate to the absence of a functioning skills intelligence system or limited deployment of available intelligence, as well as fragmentation among providers and training subsystems.

Stakeholders frequently report four main obstacles to implementing the European approach:

- the absence of a regulatory framework
- limited coordination between formal training and workplace provision
- lack of recognition of the added value of micro-credentials among companies and workers
- shortages of human, financial and technical resources.

The most recent specialisations incorporated into the Catalogue of Training Specialities include many of the elements required under the 2022 Council Recommendation. Nevertheless, further development is required with regard to definition of learning outcomes, workload and assessment requirements, as well as the design of quality assurance mechanisms. Gaps also remain concerning ECTS equivalence and stackability, particularly if micro-credentials are to function as building blocks for further qualifications.

Demand-side

On the demand side, learners and employers often struggle to identify learning opportunities that meet their needs. Micro-credentials remain largely unknown to the majority of prospective users, and the marketplace is fragmented across multiple subsystems (formal VET, continuing VET, university offer, private certificates, and sectoral initiatives). Information is often difficult to compare, and guidance systems do not systematically use labour-market data to support decision-making.

Participation patterns mirror wider lifelong-learning inequalities. Individuals with lower qualifications, limited resources or caring responsibilities face multiple obstacles, and those who might benefit most from flexible, short learning tend to participate least. In addition, work organisation practices and limited employer engagement may reduce opportunities to upskill or reskill during working life.

A number of risks need to be taken into account when considering the wider role of micro-credentials:

- unbundling competences into smaller units may conflict with holistic conceptions of professional qualifications
- increased administrative burden may place additional pressure on already limited resources
- evidence on labour-market impact remains scarce, and evaluation methodologies are still evolving.

2.7.2 Opportunities: Potential for scale-up within initial and continuing VET

Micro-credentials offer opportunities to support more flexible entry into the formal VET system, especially for learners who combine education and work or who face particular barriers to participation. Recent VET reforms allow the acquisition of micro-accreditations that could, cumulatively, contribute to a broader qualification. The approach may also improve the visibility of short courses and enhance recognition of prior learning, especially within continuing VET. In any case, micro-credentials are not viewed as substitutes for formal qualifications, nor as instruments that will fundamentally alter qualification systems.

For continuing VET, many actors consider that the Catalogue of Training Specialities provides a suitable reference for implementing the European approach, provided that agility and flexibility are maintained to respond to emerging sectoral needs. The introduction of micro-credentials also has the potential to raise the signalling value of existing training specialisations among beneficiaries and employers. Implementation could tap into the nationwide information portal, quality assurance systems and funding streams already available but legislation under which providers operate is still to be developed.

As regards digital credentialing initiatives, such as those piloted under the CertiDigital project in Higher Education Institutions, demonstrate the potential for interoperable platforms based on European standards. Although initially developed in Higher Education, such solutions could be extended to other education and training subsystems, including continuing VET and professional accreditation.

Engaging industry in the design and accreditation of micro-credentials is essential to enhance relevance and recognition. There is also scope to combine short learning with practical training or work-based experience, particularly in dynamic sectors such as automotive, cybersecurity and electrification.

2.7.3 Recommendations

Building a coherent, credible and effective micro-credential ecosystem in Spain's vehicle repair and maintenance sector will require coordinated action across five interrelated areas. Given the existing institutional foundations and the early stage of implementation, priority should be placed on consolidation, alignment and practical experimentation rather than on creating parallel structures.

a) Policy coherence and regulatory alignment

Clarify the conceptual and terminological framework at national level by establishing a shared understanding of micro-credentials, accreditations of partial competence and training specialisations, aligned with the EU Recommendation, while respecting the specific functions of each training subsystem.

Promote interoperability across formal VET, vocational training for employment and higher education by defining common minimum criteria for micro-credentials (learning outcomes, assessment, volume of learning, quality assurance and certification), rather than imposing a fully uniform regulatory model.

Leverage existing regulatory instruments—particularly the Catalogue of Training Specialities—to operationalise micro-credentials in the VET-for-employment system, thereby minimising administrative burden and avoiding duplication of frameworks.

Strengthen coordination mechanisms between national and regional authorities to reduce territorial fragmentation and ensure that regional innovation (e.g. pilot frameworks such as in Galicia) feeds into national policy learning.

b) Provider support and system capabilities

Invest in capacity-building for public and private training providers, with particular attention to curriculum modularisation, learning-outcome design, assessment of practical and transversal skills, and digital certification practices.

Encourage structured pilot projects and experimentation in priority sectors such as electric and connected vehicle repair and maintenance, using micro-credentials to test rapid responses to emerging skill needs before scaling successful models.

Address the challenges of delivery modality by supporting blended and work-based learning approaches that allow for robust practice-based assessment, recognising the limitations of fully online provision for technical occupations.

Strengthen quality assurance arrangements by clarifying workload definitions, assessment standards and requirements for stackability and progression into full qualifications.

c) Industry and sectoral collaboration

Institutionalise the involvement of employers, sectoral organisations and social partners in the design, updating and validation of micro-credentials, ensuring alignment with occupational standards and real workplace practices.

Use existing sectoral cooperation platforms—such as those linked to PERTE-VEC—as entry points to develop shared, sector-specific micro-credential pathways covering key occupational profiles along the automotive value chain, including independent repair workshops.

Promote co-investment models, including the use of sectoral training funds and collective agreements, to strengthen employer commitment and support sustainable scaling of micro-credential provision.

Encourage closer links between OEM-led training, private provision and public systems to reduce fragmentation and improve recognition and portability of learning outcomes.

d) Visibility, information and guidance

Improve the transparency and accessibility of micro-credential offers by integrating them into existing public information systems, enabling learners, employers and guidance professionals to navigate an otherwise atomised and patchy training landscape.

Strengthen career guidance services by linking micro-credentials more explicitly to labour-market intelligence, occupational profiles and progression pathways, particularly in fast-evolving technical fields.

Develop targeted awareness-raising strategies for SMEs, independent workshops, low-qualified workers and other under-represented groups, highlighting the practical value, funding options and recognition of micro-credentials.

Promote clearer communication of costs and funding opportunities, including the widespread availability of subsidies through FUNDAE, to reduce financial barriers to participation.

e) Digital recognition and platform integration

Accelerate the adoption of interoperable digital credential standards and data models (such as ELM and EDC), ensuring compatibility with Europass and emerging European digital credential infrastructures.

Promote the use of secure, portable digital credentials to enhance trust, transparency and cross-system recognition for learners and employers.

Explore integration of micro-credential data across higher education, continuing VET, public employment services and labour-market platforms, enabling better tracking of learning pathways and outcomes.

Use digital credentials as a lever to strengthen stackability, recognition of prior learning and progression into formal qualifications, supporting lifelong learning and mobility within the automotive sector.

Overall, these recommendations emphasise consolidation over expansion, coordination over fragmentation, and quality and recognition over volume. If implemented coherently, they would allow micro-credentials to move from a marginal and experimental role towards becoming a trusted and effective instrument for upskilling and reskilling in Spain's transition to electric and connected mobility.

In summary, micro-credentials currently occupy an emerging yet certainly marginal position within the Spanish education and training landscape in the Vehicle Maintenance and Repair Sector. The approach offers potential to complement existing VET systems, support lifelong learning and enable more flexible pathways into qualifications—provided that implementation is supported by robust regulatory, digital and funding frameworks. Their effective development will depend on coherent governance (national and regional), strong provider capabilities, industry collaboration, and attention to equity and accessibility

3 PORTUGAL

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3.1 Executive summary

Portugal has not yet adopted a dedicated, system-level legal definition or national register for microcredentials. Nevertheless, the country's VET and CVET ecosystem already delivers a wide range of short, outcome-oriented and modular learning offers that function in practice as micro-credential-type provision. These offers are embedded within existing qualification, regulatory and adult learning frameworks, rather than organised under a single microcredential policy architecture.

This Country Report focuses on the automotive maintenance and repair (M&R) sector, drawing on three national case studies that illustrate distinct but complementary governance logics: (i) a formal CNQ-based Technological Specialisation Course (CET) leading to an NQF/EQF level 5 qualification for EV/HV mechatronics technicians; (ii) a legally regulated attestation required for technicians intervening in motor-vehicle air-conditioning systems containing fluorinated greenhouse gases; and (iii) a market-driven, non-formal vocational upskilling pathway delivered through a stackable sequence of short EV/HV courses aligned with recognised high-voltage safety standards (DGUV 209-093). Together, these cases demonstrate that Portugal's main challenge is not a lack of relevant training activity, but rather limited system-wide coherence, visibility and connectivity across different forms of provision.

From a regulatory and policy perspective, Portugal benefits from a strong National Qualifications Framework (NQF), a mature National Catalogue of Qualifications (CNQ), and well-established adult learning instruments (e.g. RVCC, Certified Modular Training). Recent policy reforms and national strategies promoting lifelong learning, digital skills and flexibility further support the conditions under which micro-credential-type provision can emerge. However, the absence of a shared definition, common metadata standards and a national registry results in fragmented recognition, uneven portability and limited stackability, particularly between formal, regulated and non-formal contexts.

In terms of provision and governance, micro-credential-type learning is delivered by a heterogeneous mix of public VET providers, higher education institutions, private training organisations, employer academies and sectoral bodies. This diversity supports responsiveness to labour market needs, especially in fast-evolving domains, but also leads to variable quality assurance practices and inconsistent employer trust. Sectoral intermediaries and employers play a crucial role in signalling skills needs and co-designing provision, yet SME participation remains constrained by cost, time and uncertainty about progression value.

The report identifies green and digital transitions as the primary socio-economic and technological drivers of micro-credential demand in automotive M&R. Electrification (EV/HV safety, diagnostics, battery systems), environmental compliance and emerging digital requirements (software-enabled diagnostics, cybersecurity) are reshaping occupational profiles faster than traditional curricula can adapt. While Portugal has access to multiple sources of labour market intelligence, these remain fragmented and are not systematically integrated into curriculum updating processes.

Key alignment findings show that micro-credential-type provision is broadly compatible with CVET and NQF architectures, particularly at levels 4 and 5, but that formal NQF referencing, credit allocation and EU interoperability tools are applied inconsistently. Alignment is strongest where provision is anchored in the CNQ or regulated frameworks, and weakest in non-formal employer-driven pathways, despite their high labour market relevance.

Overall, the report highlights several priority challenges: lack of a unified national framework for microcredentials; fragmented recognition and quality assurance regimes; limited stackability and progression clarity; uneven access for SMEs and adult learners; and slow feedback loops between skills intelligence and training renewal.

Priority policy recommendations for WP4 and WP5 therefore focus on connecting existing instruments rather than creating parallel systems. These include: establishing shared national criteria and metadata for microcredentials (including learning outcomes, workload, assessment and NQF referencing where feasible); developing a national registry or portal that transparently presents formal, regulated and sector-certified short courses; strengthening quality assurance and digital credentialing standards aligned with EU frameworks; reinforcing employer and sectoral co-design while broadening SME participation; and expanding targeted support measures to enable adult learners and SMEs to engage in modular upskilling pathways.

3.2 National policy and regulatory framework

3.2.1 Existing policy & regulatory instruments relevant to microcredentials

While Portugal does not yet have a fully dedicated law for MCs (as of mid-2025), various policies, instruments, and legal frameworks already support or could be leveraged for the development, recognition, and integration of microcredentials.

Key instruments and actors

In the absence of a dedicated national framework for microcredentials, Portugal relies on a set of established qualification, certification and adult learning instruments that collectively shape how short, outcome-oriented training is designed, delivered and recognised. These instruments span both formal and non-formal education and involve multiple public authorities and intermediary bodies with distinct but complementary mandates. Together, they provide the structural backbone within which micro-credential-type provision can operate, particularly in CVET and sector-specific upskilling contexts such as automotive maintenance and repair.

The table below outlines the main national systems, legal instruments and institutional actors that are most relevant for the development, recognition and potential integration of microcredentials, highlighting how existing mechanisms already support — or could be leveraged to support — modular, short-duration learning offers.

Table 1 Instruments supporting the development, recognition, and integration of microcredentials

Instrument / Body	Mandate / Function	Relevance to Microcredentials
National Qualifications System (Sistema Nacional de Qualificações, SNQ / National Qualifications System – NQS) established by Decree-Law No. 396/2007 (amended by Decree-Law No.14/2017). (ANQEP)	Integrates and articulates all non-higher and higher education qualifications; provides structure for education & training, including adult learners; sets up instruments for recognising non-formal & informal learning (RVCC) and organising VET and professional certification. (ANQEP)	Provides a legal backbone, including existing qualification levels, recognition & certification of competences, credit systems in VET, and adult learning, which microcredentials would need to align with or map onto.
National Qualifications Framework (NQF / QNQ / Quadro Nacional de Qualificações) as regulated by Portaria No. 782/2009 (Ordinance 782/2009), effective October 2010. (ANQEP)	Defines levels (1-8), learning-outcome descriptors (knowledge, skills, attitudes), applies across all subsystems (basic, secondary, higher, VET), and includes non-formal/informal, adult learning. (DGES)	Essential reference for mapping any microcredential to a recognised level; ensures comparability and potential recognition.
National Catalogue of Qualifications (NCQ / Catálogo Nacional de Qualificações, CNQ)	Manages non-tertiary qualifications (levels up to 5), defines the VET/professional qualifications & training paths; standardises competences, training referentials; includes sector councils, etc. (ANQEP)	Microcredentials targeting levels ≤5 (or those bridging to them) may sometimes overlap with existing catalogued qualifications or utilize similar short, modular units (UFCD – Unidade de Formação de Curta Duração). (CEDEFOP)

Instrument / Body	Mandate / Function	Relevance to Microcredentials
Recognition, Validation and Certification of Competences (RVCC / Reconhecimento, Validação e Certificação de Competências) / Centros Qualifica / Qualifica Programme	Legal route for non-formal and informal learning to be recognised both for academic and vocational qualifications; includes adult learners; local centres provide flexible pathways. (lifelonglearning-toolkit.uil.unesco.org)	Microcredentials are often offered in non-formal, informal, or blended modes; alignment or recognition via RVCC or similar could provide a route to formal recognition. Changes in 2022 increased flexibility, raising the possibility of level 5 access via some adult pathways. (CEDEFOP)
Certified Modular Training (Formação Modular Certificada, including UFCD-type units)	Short-duration training units, modular forms of training, especially in adult education and VET, are used at non-tertiary levels. (CEDEFOP)	Very similar in spirit to microcredentials, they are modular and potentially stackable. Might serve as a precedent or a model.
Ordinances (2022) affecting adult learning, RVCC, and flexibility (e.g., Ordinance No. 61/2022 – RVCC; Ordinance No. 62/2022 – centres; also Ordinance relating to modularity and apprenticeship+ etc.) (CEDEFOP)	These reforms introduced new flexibility, allowing adults to obtain level 5 qualifications, loosened steps in local centres, allowed shorter/ modular courses, enhanced recognition of digital skills, etc. (CEDEFOP)	These legal changes make the environment more receptive to MCs, particularly for adult learners and those seeking digital skills.

Plans and Strategy Directions

Beyond specific legal instruments, Portugal's policy environment is shaped by **broader strategic programmes and national priorities** that promote lifelong learning, skills upgrading and responsiveness to labour market change. While these strategies are not explicitly framed around microcredentials, they strongly encourage modularisation, short training cycles and flexible pathways, particularly for adults and workers.

The initiatives listed below reflect how national strategies related to **adult qualifications, digital transformation and employability** are creating favourable conditions for micro-credential-type provision to expand, especially in sectors affected by rapid technological change and the green and digital transitions. These strategic directions help explain why short, targeted training formats are increasingly used in practice, even in the absence of a formal MC policy framework.

- **Qualifica Programme: umbrella framework for adult qualifications, RVCC, Centros Qualifica, etc. Promotes lifelong learning, raising qualification levels. Supports double certification (school + professional).**
- **Digital Skills Initiatives: INCoDe.2030, Digital Skills and Jobs Coalition, “Portugal Digital Strategy”, National AI Strategy (“AI Portugal 2030”), etc. These policies drive demand for digital competencies, adaptability, and short training, often in modular formats.**
- **“Jovem + Digital”: Specific programmes offering short/medium training paths (up to specific hours), improving digital skills, with certification and crediting toward level 4/5 qualifications.**

3.2.2 Gaps, barriers, and limitations

Despite the existence of several enabling instruments within Portugal's qualifications and adult learning ecosystem, micro-credential-type provision remains constrained by a set of **structural gaps and implementation barriers**. These limitations are particularly visible when comparing different forms of short training (formal CNQ/CET pathways, legally regulated attestations, and non-formal upskilling sequences), where recognition, portability and transparency vary significantly depending on governance model and provider type.

The table below synthesises the main barriers affecting the emergence of a coherent microcredentials ecosystem, focusing on issues such as the absence of a common definition and standards, fragmented recognition across contexts, inconsistent quality assurance practices, and limited stackability into progression pathways.

Table 2 Gaps and barriers constraining the development of microcredentials

Gap / Barrier	Description
Absence of a specific legal definition/regulation of microcredentials	There is no law (as of the latest data) that explicitly defines “microcredentials”—what counts, how they are measured (in credits, ECTS, or hours), quality criteria, recognition by public authorities/employers, etc. Existing modular training and VET pieces are used, but these are not always labelled or recognised as microcredentials.
Fragmented recognition/portability	While NQF and RVCC provide routes for non-formal/informal learning recognition, there is no systematic process ensuring that microcredentials (especially from higher education, private providers, or online providers) are recognised by employers, HE institutions, or VET paths. Portability across sectors (e.g., from private provider to HE or VET) is weak.
Quality assurance/standards consistency	HEIs have their internal QA systems, as do VET and adult education institutions. Still, there is no unified QA framework specific to microcredentials: no minimum metadata requirements, no standardized assessment practices, and inconsistent credibility.
Mapping/credit/stacking challenges	Modular training units (UFCDs) and short courses may align with level descriptors, but are often not easily stackable into larger qualifications. For example, ECTS or equivalent credit recognition for microcredentials from non-HEIs is uneven. There is a risk that learners accumulate credentials without being able to translate them into formal qualifications or credit accumulation.
Sectoral and provider variability	While public providers (universities, polytechnics, and VET centres) are involved, many micro-type offers come from private or third-sector providers, which may or may not follow national qualification standards. Some sectors are more active (digital, AI, cybersecurity), but others are less represented.
Learner awareness, cost, equity	Learners may not be aware of MC offers, their recognition status, or how they count toward more advanced qualifications. Learners may bear costs; public subsidies are uneven. Those with fewer resources or prior qualifications face barriers.

3.2.3 Extent to which current policies support MC development, recognition & integration

The extent to which current Portuguese policies support micro-credential development, recognition and integration varies across different **policy dimensions and implementation layers**. Rather than constituting a unified framework, support for micro-credentials is distributed across existing qualification systems, adult learning reforms, strategic skills agendas and funding instruments. Some of these elements already align well with micro-credential principles, while others remain only partially supportive or underdeveloped.

The bullet points below therefore examine **key areas of policy support**, highlighting where current instruments enable micro-credential-type provision in practice and where limitations continue to affect recognition, portability and system-wide integration..

- **Legal alignment possibility:** The NQF / QNQ already provides a nationally recognised structure with levels and descriptors; the National Catalogue & qualification instruments in non-tertiary levels provide for modularised units & certification. These are positive foundations on which microcredentials can be mapped, particularly at the lower/middle levels.
- **Recent policy reform toward more flexibility:** The 2022 ordinances (Ordinance No. 61/2022, 62/2022, etc.) expanded adult learning pathways, introduced modular training, allowed level 5 access for adults, and made recognition & assessment more flexible. These are supportive of microcredentials being inserted into adult CVET paths.

- **Strategies pushing digital & skills demand:** INCoDe.2030’s Skills & Jobs Coalition, Portugal’s Digital Strategy, and AI strategy, among others, all imply short, flexible, upskilling/reskilling programs. These create demand and justification for microcredentials.
- **Funding and public investment:** Some public programmes and NextGenerationEU/Recovery & Resilience Plan funding (e.g., digital upskilling, adult education) provide financial resources that could support microcredential development; initial steps like “Microcreds Plan” for universities are being proposed. (Note: “Microcreds Plan” initiative is reported in sources.

3.2.4 What remains to be done — Towards a more coherent & sustainable MC ecosystem

While Portugal already displays many of the functional elements associated with micro-credentials, these elements remain fragmented and unevenly connected across policy domains and provider types. Moving towards a coherent and sustainable micro-credential ecosystem therefore requires targeted action that goes beyond incremental adjustments to existing instruments.

Below we identify priority areas for policy and system development, outlining the key components that would be needed to improve clarity, trust, portability and long-term sustainability of microcredentials within the national education and training architecture.

- **A legal/regulatory definition of microcredentials:** what fits (duration, learning outcomes, level, hours/credits), what metadata is needed, what standards. This would help avoid the proliferation of unstandardised, low-quality offers.
- **A registry or catalogue of recognised microcredentials,** including public and private providers, clearly indicating their alignment with NQF/EQF/QF-EHEA, recognition status, credit transferability, etc.
- **Unified or interoperable QA standards specific to microcredentials,** possibly building on existing HE QA and VET QA frameworks but adapted for modularity, digital delivery, and credential stacking.
- **Clear credit systems & stacking mechanisms,** so that microcredentials can be aggregated (stacked) toward larger qualifications (VET and HE), with clarity for learners on how this works.
- **Mechanisms for labour market recognition:** ensuring employers understand and accept microcredentials, public sector recognition, linking credentials to job requirements, and encouraging co-design with industry.
- **Policies to ensure equity, access, and affordability,** especially for low-qualified adults, rural areas, and underrepresented groups; including public subsidies or voucher systems, recognition of non-formal/informal prior learning.
- **Enhanced flexibility in adult learning pathways,** modular training, recognition of non-formal/informal learning, including work-based, blended, and online.

3.3 Key stakeholders and cooperation ecosystem

MCs in Portugal sit at the intersection of public education and training systems, higher education, employers, sectoral bodies, and regional partnerships. While still a developing policy area, there is growing awareness among all stakeholders of MCs' potential to support lifelong learning, reskilling, and sectoral competitiveness. Cooperation is advancing, but often fragmented and project-based, with limited systematic frameworks for governance, co-funding, or recognition.

3.3.1 How microcredentials are understood by key stakeholder groups

Microcredentials are not yet understood in a uniform way across the Portuguese education, training and employment ecosystem. Instead, their meaning and perceived value vary according to each stakeholder's **institutional role, regulatory environment and proximity to labour market needs**. Public authorities, education and training providers, employers and worker representatives tend to interpret microcredentials through the lens of existing instruments and practices with which they are already familiar.

The bullet points below summarise how different stakeholder groups currently **perceive, interpret and engage with micro-credential-type provision**, highlighting both convergences and areas of divergence that influence adoption, recognition and trust.

Public VET providers (e.g., Centros de Formação Profissional, Qualifica Centres):

- **See MCs as extensions of modular training (UFCDs) and short VET offers already in place.**
- **Value lies in creating stackable, flexible routes for adults and workers who need upskilling without committing to complete qualifications.**
- **Concern: risk of duplication with existing National Catalogue of Qualifications (CNQ) modules if not well integrated.**

Higher Education Institutions (HEIs – universities, polytechnics):

- **Conceptualise MCs as short, credit-bearing learning units aligned with Bologna/ECTS that may be stacked toward diplomas.**
- **Value: innovation, diversification of student base, responsiveness to the labour market.**
- **Some HEIs already experimenting with digital badges and EU pilots (e.g., MicroCreds project).**

Employers (particularly in digital, automotive, energy, and health):

- **Perceive MCs as fast, targeted solutions for skill shortages (e.g., cybersecurity, EV maintenance, AI/data skills).**
- **Value is most substantial when MCs are co-designed with industry standards and recognised across companies.**
- **Concerns: credibility of offers; interoperability with internal HR/training systems.**

Employees / Trade Unions:

- **Workers are interested in MCs for career progression and recognition of prior learning, mainly if publicly funded.**

- Unions emphasise the need for MCs to be accessible, affordable, and recognised in collective bargaining contexts, rather than employer-exclusive credentials.
- Value: supporting employability, mobility, and security in transitions (e.g., automotive → EV).

Automotive associations & sector bodies (e.g., ACAP):

- See MCs as critical to managing green and digital transition, especially EV, battery, and software skills.
- Advocate for EU-level alignment (so MCs are portable across the supply chain).

3.3.2 Typology of microcredential providers

Micro-credential-type provision in Portugal is delivered by a **diverse set of providers** operating across formal education, vocational training, non-formal learning and industry-led contexts. Rather than forming a single provider category, microcredentials emerge from different institutional logics, funding models and quality assurance arrangements. This diversity contributes to innovation and responsiveness but also results in **uneven recognition and comparability** across offers.

Below, the main types of providers currently involved in micro-credential-type provision are described, highlighting their typical roles, strengths and limitations within the national ecosystem.

- **Public VET providers:** Centros Qualifica, IEFP training centres, sectoral training centres. Often aligned to CNQ and financed by state/EU funds. MC-like offers typically consist of short, modular training sessions.
- **Higher Education Institutions:** universities and polytechnics piloting credit-bearing MCs, often digital/AI, management, and health. Supported by PRR (Recovery & Resilience Plan) initiatives.
- **Private academies and edtech providers:** e.g., Code for All, Flag, Academia de Código. Provide rapid, market-driven MCs, primarily focusing on digital skills. Recognition is uneven.
- **Employer/industry platforms:** large companies (e.g., EDP, Altice, Bosch, Volkswagen Autoeuropa) delivering internal MCs for workforce upskilling; some beginning to badge them digitally.
- **International/European projects:** Automotive Skills Alliance, Digital Skills and Jobs Coalition Portugal – funding MC pilots and interoperability projects.

3.3.3 Sectoral intermediaries

Sectoral intermediaries play a bridging role between policy frameworks, education and training providers, and labour market needs. In the context of micro-credential-type provision, these actors contribute to translating emerging skills demands into training content, supporting standard-setting, and fostering cooperation across institutions and employers. Although their involvement in microcredentials is not yet systematised, sectoral intermediaries are particularly influential in technically specialised and rapidly evolving fields such as automotive maintenance and repair.

The main types of sectoral intermediaries involved are:

- **Skills Councils / Sectoral Councils of the CNQ:** oversee qualification design; potential gatekeepers for MC integration into national catalogues.

- **Trade Unions (UGT, CGTP):** involved in CVET policy, emphasise MCs' role in ensuring fair access and employability guarantees.
- **Chambers of Commerce & Industry associations:** advocate for flexible, rapid MCs aligned with SME needs.
- **Automotive Associations (ACAP, ASA):** support sector-specific MCs (EV, batteries, logistics, cybersecurity). Strong push for cross-border cooperation with EU automotive partners.

3.3.4 Role of employers and industry bodies

Employers are a central driver of micro-credential-type training in Portuguese automotive M&R, particularly where technological change creates urgent, safety-critical needs (e.g., EV/HV high-voltage intervention, diagnostics, and environmental compliance in refrigerant handling). In practice, employer engagement is most visible through three mechanisms:

- **Needs signalling and uptake:** workshops, dealer networks and fleet operators increasingly request short, targeted training to maintain service capability as vehicle technologies evolve, even when training is not legally mandated (as in EV/HV upskilling pathways).
- **Coherence with regulated requirements:** in areas governed by EU and national environmental legislation (e.g., fluorinated refrigerant handling), employers rely on authorised training and standardised assessment to ensure legal compliance and reduce operational risk.
- **Work-based learning and progression:** in formal pathways such as CETs, employers provide work-based learning placements that reinforce occupational relevance and facilitate progression into employment or specialist roles.

SME participation can be constrained by limited HR capacity, short-term operational pressures, and uncertainty about how non-formal certificates translate into recognised progression opportunities. Strengthening sectoral guidance and improving visibility of stackable pathways are therefore important for broader adoption.

- **Upskilling focus:** MCs applied for digitalisation, EV maintenance, cyber-resilience, soft skills (project management, leadership)

3.3.5 Regional and local partnerships

Microcredential governance in Portugal is currently distributed across existing qualification, training and regulatory infrastructures rather than managed through a single dedicated microcredential authority. In the automotive M&R field, the three case studies show three complementary governance logics:

- **Qualification-system governance** (formal VET/CVET): CNQ-based qualifications and CETs are designed and updated under ANQEP coordination and sectoral councils, with authorised providers operating under defined referentials and quality conditions.
- **Regulatory governance** (legally mandated competence attestations): environmental and safety-related attestations are framed by EU rules and national transposition, with competent authorities authorising providers and defining assessment requirements and validity/renewal conditions.

- **Market and provider governance** (non-formal vocational upskilling pathways): short vocational certificates respond to employer demand and are sustained through provider quality systems (e.g., DGERT certification) and recognised external standards (e.g., DGUV 209-093 for high-voltage safety).
- **Co-investment models vary accordingly:** regulated attestations and non-formal vocational upskilling pathways are typically funded through participant or employer fees, while formal pathways may rely on institutional operational funding and existing public financing mechanisms. A key opportunity for scale-up is to align these governance streams through shared metadata, transparency rules and clearer progression routes between non-formal and formal learning.

Other examples like the Digital Portugal Academy (INCoDe.2030), partnerships between public agencies, HEIs, and tech companies offering short digital MCs, are also in place in different sectors.

3.3.6 Challenges in cooperation

Despite growing awareness of the potential value of microcredentials, cooperation among stakeholders remains **uneven and largely fragmented**. Collaboration tends to occur through time-limited projects, sector-specific initiatives or bilateral arrangements, rather than through stable, system-wide governance mechanisms. These coordination challenges affect the design, delivery and recognition of micro-credential-type provision and limit its scalability and sustainability.

The **main challenges hindering effective cooperation**, may be summarized as:

- Lack of formalised national coordination mechanism → MC cooperation is often project-based.
- Unequal involvement of SMEs compared to large firms.
- Tension between academic credit-bearing MCs (HEIs) and industry-recognised MCs (employers).
- Risk of fragmented recognition unless NQF mapping and common QA standards are agreed.
- Trade unions call for greater worker participation in MC design and governance.

3.4 MC offerings and learning pathways

The landscape of Microcredentials (MCs) in Portugal is diverse but still consolidating. Provision ranges from university-issued ECTS-bearing modules to short, non-formal certificates offered by VET centres, employer academies, and private training providers.

To ground the national mapping in concrete automotive M&R examples, Table 3 summarises the three Portuguese case studies analysed for this report and highlights how they represent distinct micro-credential-type logics (formal qualification, regulated attestation, and non-formal stackable vocational upskilling pathways).

Table 3 Summary of the three Portuguese case studies analysed for this report

Case-study credential	Type / status	Skill domain	Duration / workload	Recognition & governance	NQF/EQF link	Stackability / pathway role
Specialist Technician in Automotive Mechatronics for EV/HV (CET 525RA019)	Formal qualification (CET)	Green transition (electrification)	1400 hours (1000 centre + 400 work-based learning)	CNQ/CET governance; authorised providers; DGERT + IEFP authorisation;	NQF/EQF level 5 (via CNQ)	Unit-level partial certification; progression from level 4; potential credit

Case-study credential	Type / status	Skill domain	Duration / workload	Recognition & governance	NQF/EQF link	Stackability / pathway role
				SIGO + Passaporte Qualifica		transfer towards HE
Technicians for intervention in motor-vehicle air-conditioning systems (F-gases)	Regulated attestation (mandatory for practice)	Green transition (environmental compliance)	Minimum 12h training + 1.5h assessment; validity 7 years	EU & national regulation; competent authority authorisation (ApC/APA); mandatory practical assessment; SIGO registration	Implicit link through CNQ competence unit at level 4 (EQF 4)	Vocational upskilling pathways via renewal cycle; complements level 4 technician pathways; portability grounded in harmonised EU learning outcomes
EV/HV training learning pathway (4 short courses)	Non-formal vocational certificates	Green transition (EV/HV safety & diagnostics)	30 hours total (2h + 7h + 14h + 7h)	Employer-driven demand; DGERT provider QA; trainers certified to DGUV 209-093; SIGO registration	No formal NQF mapping / credits	Clearly stackable sequence; flexible entry; supports rapid upskilling alongside employment

Provider types

Micro-credential-type provision in Portugal is characterised by a heterogeneous provider landscape, shaped by different institutional missions, regulatory regimes and links to the labour market. Public education and training institutions, private providers and industry-led structures all contribute to the offer, but do so under distinct governance, funding and quality assurance conditions. These differences are reflected in the types of microcredentials available, their target audiences and their potential for recognition and progression.

Against this background, the provider landscape can be grouped into several broad categories, each playing a specific role within the national micro-credential ecosystem:

- **Formal education institutions:** universities, polytechnics, public VET schools (often stackable with ECTS or CNQ modules).
- **Non-formal providers:** adult education centres (Qualifica), NGOs, local associations.
- **Industry brands & academies:** corporate training, often internally recognised.
- **Sector associations:** automotive (ACAP, Automotive Skills Alliance), chambers of commerce, digital skills coalitions.

Formats of microcredentials

Microcredentials in Portugal are delivered through a **variety of formats**, reflecting differences in pedagogical approach, assessment methods, and intended use in education or employment contexts. These formats range from more traditional certificates linked to formal education systems to newer digital and hybrid forms that emphasise visibility and rapid signalling of skills. The choice of format has implications for how learning is assessed, how credentials are communicated to employers, and how easily they can be combined with other learning experiences.

In practice, several **distinct formats** can be identified within the current micro-credential landscape, illustrating the diversity of approaches used by providers across sectors:

- **Certificates/diplomas:** common in HEIs, often with ECTS.
- **Digital badges:** piloted in HEIs and industry digital skills projects.
- **Professional certifications/licences:** sector-specific (e.g., Cisco Networking Academy, Microsoft Azure, EV safety).
- **Hybrid forms:** e.g., course certificate + digital badge for employability visibility.

Delivery modes

The delivery of micro-credential-type learning in Portugal reflects a growing emphasis on flexibility and accessibility, particularly for adult learners and workers. Different delivery modes are used to accommodate time constraints, geographical dispersion and the need to combine learning with employment, while still ensuring the acquisition of practical and job-relevant skills. In technically demanding fields, delivery choices also balance digital solutions with the need for hands-on practice.

Accordingly, micro-credentials are offered through a range of delivery modes, each with different implications for learner engagement, assessment and alignment with workplace requirements:

- Online (dominant in digital MCs): **MOOCs, blended short courses.**
- Hands-on/labs: **technical VET (Tinkercad, EV repair, CNC machining).**
- Hybrid: **many HEIs mix online theory with practical assignments.**
- Workplace-based/simulations: **particularly in automotive, energy, and health.**

3.4.1 Target groups

Micro-credential-type provision in Portugal addresses a diverse set of learners, reflecting the varied objectives of short, modular training within the education and labour market systems. While many offers are designed with adult learners and workers in mind, target groups differ according to provider type, skill level and sectoral focus. These differences influence entry requirements, delivery formats and the role that microcredentials play within broader learning and career pathways.

Within this context, micro-credential provision can be understood as serving several distinct target groups, each with specific motivations and constraints regarding participation in short-cycle learning:

- **Adults in CVET:** unemployed or low-qualified adults accessing Qualifica/IEFP modular courses.
- **Employees in transition sectors:** automotive, energy, and IT professionals needing upskilling.
- **Students/young graduates:** HEIs offering microcredentials as a way to “top up” academic studies.
- **SMEs:** targeted through chambers of commerce and industry-led MCs.

3.4.2 Pedagogical design

The pedagogical design of micro-credential-type learning in Portugal reflects a gradual shift towards modular, outcome-oriented and learner-centred approaches, although practices remain uneven across providers. Design choices are influenced by institutional traditions, sectoral requirements and time constraints associated with short training cycles. These factors affect how learning outcomes are defined, how content is structured and how learners engage with the training process.

Different pedagogical approaches can therefore be observed, illustrating how microcredentials are designed to balance flexibility, depth of learning and labour market relevance:

- **Modularity:** Many MCs are modular, especially those linked to the CNQ (short training units / UFCDs).
- **Stackability:** Strong in HEIs (ECTS credits can accumulate), weak in non-formal/industry MCs.
- **Learner-centredness:** Growing attention to flexible delivery (evening/weekend courses, online formats), but uneven support for diverse learner needs.
- **Transversal skills integration:** Some digital MCs embed teamwork/problem-solving, but most focus narrowly on specific skills.

3.4.3 Breadth and depth

Microcredentials vary considerably in terms of their scope and level of specialisation. Some are designed to provide broad introductory exposure to a skill domain, while others focus on deepening expertise in a narrowly defined technical area. This distinction influences their role within learning pathways, particularly with regard to progression, employability signalling and stackability with other credentials.

Current provision illustrates several orientations in terms of breadth and depth, reflecting different policy, provider and labour market priorities:

- **Breadth-focused MCs:** wide coverage of basic skills (digital literacy, general sustainability).
- **Depth-focused MCs:** advanced/specialist MCs in EV batteries, AI, and renewable energy technologies.
- **Tools vs integrated skills:** majority still tool-focused (Excel, CAD, coding languages), with fewer holistic transversal programmes.

3.4.4 Entry requirements and duration

Entry requirements and duration are key characteristics shaping access to micro-credential-type learning and its suitability for different learner profiles. In Portugal, these parameters are not standardised and vary according to provider type, regulatory context and target skill level. As a result, microcredentials differ significantly in accessibility, intensity and workload. Observed practices can be grouped according to common patterns in entry conditions and typical duration of training:

- **Entry requirements:** vary widely – HEI MCs often require secondary school or higher; VET MCs are accessible with lower formal education; private MCs sometimes open to all.
- **Duration:** typically, 25–100 hours (equivalent to 1–5 ECTS), but corporate/IT certifications can be longer.

3.4.5 Standards setting

Standards-setting arrangements play an important role in determining the credibility and comparability of microcredentials. In the Portuguese context, standards may be defined by public authorities, sectoral bodies, higher education quality agencies or industry actors, depending on the nature of the credential. This plurality supports relevance but also contributes to fragmentation.

Several approaches to standards setting can be identified, reflecting the different governance logics underpinning micro-credential-type provision.

- **Standards actors:** ANQEP and sectoral councils (for CNQ-based modules); A3ES (for HEI MCs); industry certification bodies (e.g. Cisco, Microsoft, Bosch Academy).
- **Skills intelligence deployment:** automotive and energy sectors increasingly use EU skills intelligence tools (ESCO, sectoral alliances) to guide curriculum.

3.4.6 Assessment and alignment with industry standards

Assessment practices are central to employer trust and learner recognition of microcredentials. In practice, approaches range from formal examinations to practical demonstrations and workplace-based assessment, often influenced by sectoral or regulatory requirements. Alignment with recognised industry standards is particularly important in technical and safety-critical domains.

Existing micro-credential-type offers therefore display a range of assessment models and degrees of industry alignment:

- **Assessment methods:** exams, project-based assessments, lab simulations, and workplace observation.
- **Industry alignment:** strong in ICT (Cisco, Microsoft, AWS certifications); emerging in EV/energy (aligned with EU directives, safety standards).
- **Workplace relevance:** weaker in transversal/soft skills MCs.

3.4.7 Use of skills taxonomies, metadata, and digital systems

The visibility and portability of microcredentials depend increasingly on the use of **skills taxonomies, metadata standards and digital infrastructures**. While Portugal has national systems for recording certified learning, the systematic use of common taxonomies and interoperable metadata remains limited. This affects transparency for learners and employers, particularly across provider types.

Different levels of engagement with taxonomies, metadata and digital credentialing tools can be observed across current provision.

- **ESCO taxonomy:** referenced in EU-funded projects (Digital Skills and Jobs, Automotive Skills Alliance).
- **Metadata use:** still weak nationally; no unified metadata system or national MC registry, outside the National Catalogue of Qualifications.
- **Digital badges (EDCI):** pilot use by HEIs, but not systematic.

3.4.8 Quality assurance and transparency

Quality assurance arrangements for microcredentials are shaped by the broader systems in which providers operate. Higher education, VET and non-formal training follow distinct QA logics, which are not always adapted to short, modular learning. This results in variable transparency regarding learning outcomes, assessment rigor and recognition value:

- **HEI MCs:** subject to A3ES quality assurance, generally strong.
- **VET/adult learning MCs:** use ANQEP/CNQ standards but lack MC-specific QA.
- **Private/corporate MCs:** variable quality; rely on brand recognition, and DGERT certification of training providers.
- **Transparency & comparability:** partial — some MCs linked to NQF/EQF, many remain outside.

3.4.9 Reference to international/EU-funded projects

International and EU-funded initiatives play a significant role in shaping experimentation with microcredentials in Portugal. These projects often act as testing grounds for new formats, governance models and digital solutions, while also promoting alignment with European frameworks. Their influence extends beyond individual pilots by informing national debates and provider practices.

Several international and EU-level initiatives are particularly relevant in this context, such as:

- **EU Recovery and Resilience Plan (PRR):** funds expansion of modular training and MCs in Portugal.
- **Automotive Skills Alliance:** pilots MC recognition for EV and battery skills.
- **European MicroCreds project:** Portuguese HEIs experimenting with standardised microcredentials and digital badges.
- **INCoDe.2030 & Digital Skills and Jobs Coalition:** EU-linked initiatives supporting digital MCs.

3.5 Effectiveness of microcredential implementation

Microcredentials are increasingly viewed as a strategic tool to address **skills shortages** and to enable **rapid upskilling and reskilling** in the automotive maintenance and repair sector. Their effectiveness depends not only on the quality of provision but also on the degree of **recognition by employers**, the **alignment with sectoral skill demands**, and the **extent to which they produce tangible outcomes** for learners and companies.

3.5.1 Perceptions and use

Perceptions of microcredentials in Portugal vary significantly depending on stakeholders' roles, prior experience with short-cycle training and proximity to labour market needs. While micro-credential-type provision is increasingly recognised as a flexible and practical tool for upskilling and reskilling, its actual use remains uneven across sectors and learner groups. Differences in visibility, recognition and trust strongly influence whether microcredentials are adopted as a meaningful component of education and career pathways.

The different stakeholders' perspectives can be summarized as:

- **Employers:** Many employers see MCs as a flexible way to meet immediate training needs, especially in areas such as **electric vehicle systems, diagnostics, and digital service tools**. However, some remain cautious, viewing MCs as complementary rather than equivalent to formal qualifications. Recognition often depends on whether the MC comes from a trusted provider (e.g., HEIs, OEM academies, sector associations).
- **Employees:** Workers perceive MCs as a practical route to **career progression** and as proof of competence in emerging technologies. Short duration and flexibility are attractive, though lack of visibility in HR frameworks sometimes limits impact.
- **Jobseekers:** For jobseekers, MCs can serve as a signal of **initiative and job-readiness**, but limited awareness among employers can reduce their value.
- **Employment services:** Public employment services (IEFP) increasingly recommend modular training, yet there is no systematic integration of MCs into **job-matching platforms or qualification pathways**.

3.5.2 Labour market relevance

The relevance of microcredentials to the labour market is closely linked to their ability to address specific, time-sensitive skills needs. In Portugal, this relevance is strongest in sectors undergoing rapid technological change, where traditional qualification pathways struggle to adapt at the same pace. However, labour market alignment is not uniform and depends on the degree of employer involvement in design, assessment and recognition.

Current micro-credential-type offers respond as follows:

- The sector faces **green transition gaps** (electric mobility, battery systems, energy efficiency in workshops) and **digital transition gaps** (diagnostics software, cybersecurity of connected vehicles, digital customer services).
- MCs are often **job- and tool-specific** (e.g., EV charging protocols, diagnostic equipment use), but transversal skills (problem-solving, safety compliance, teamwork) are less systematically addressed.
- Alignment with labour market needs is strongest where MCs are **co-designed with OEMs or sector associations**; gaps remain in SME-oriented provision, where access and cost are barriers.

3.5.3 Adoption enablers and barriers

The uptake of microcredentials is influenced by a combination of enabling factors and persistent obstacles operating at organisational, financial and systemic levels. While certain conditions support experimentation and use, others constrain participation and limit scalability, particularly for smaller employers and disadvantaged learner groups:

Enablers:

- Co-funding schemes (e.g., PRR, sectoral training funds).
- Industry-driven initiatives (Automotive Skills Alliance, OEM training academies).
- Flexibility of delivery (online + hands-on).

Barriers:

- **Organisational:** SMEs often lack HR capacity to identify training needs and integrate MCs into workforce development.
- **Financial:** Limited budgets for continuous training in smaller workshops.
- **Cultural:** Preference for traditional qualifications, especially among older employers.
- **Systemic:** Lack of a **national MC registry or transparent recognition mechanisms** hinders trust and comparability.

3.5.4 Recognition and trust

Recognition and trust are critical determinants of the value attributed to microcredentials by employers and learners. In the Portuguese context, trust is often built through links to established institutions, sectoral standards or regulatory frameworks, while stand-alone credentials may face scepticism. Inconsistent recognition mechanisms further affect portability and long-term value. The factors that influence trust in microcredentials and the conditions under which they are more likely to be recognised and used meaningfully are:

- **Assessment practices:** While some MCs use project-based or workplace simulations that demonstrate competence, others rely on multiple-choice tests, which employers perceive as less reliable.
- **Trust factors:** Recognition is highest when MCs are linked to **OEMs, sectoral associations, or international certifications** (e.g., Bosch Academy, ASA certifications).
- **Framework alignment:** Few MCs are yet formally referenced to the **NQF/EQF**; stackability into formal pathways is mainly visible in HEI and VET modular offers. Recognition through **RPL (Recognition of Prior Learning)** frameworks remains limited.

3.5.5 Outcomes and impact

Assessing the outcomes and impact of microcredentials remains challenging due to limited systematic data and the relative novelty of many initiatives. Where evidence exists, it points to positive effects in terms of faster skills acquisition and improved workplace readiness, though broader labour market impacts are harder to demonstrate.

The points that follow consider available evidence on outcomes and impact, drawing attention to differences across types of micro-credential-type provision and to gaps in monitoring and evaluation:

- **Employment outcomes:** Early evidence suggests that MCs in EV and digital diagnostics improve employability in high-demand roles, but systematic outcome data (employment rates, wage effects) are still scarce.
- **Employer ROI:** Employers report **faster time-to-competence** for MC-trained staff compared to traditional courses, particularly in tool-specific areas.

Outcome evidence varies across the three case-study models, reflecting differences in maturity, legal status and data availability:

- Formal CET pathway (EV/HV mechatronics technician): the programme is recent, and the first cohorts began only in the previous year. As a result, no consolidated outcome indicators (completion,

employability, career progression, employer adoption) are yet available, although the qualification is structurally positioned to support progression to specialist roles and further learning.

- Regulated attestation (F-gases in vehicle AC): the scheme has operated for many years and has certified several thousand technicians nationally since 2011, enabling legal practice and supporting environmental compliance. Periodic renewal requirements (validity period and refresher training) also function as an embedded vocational upskilling pathways mechanism.
- Non-formal EV/HV vocational upskilling pathways: outcomes are primarily reflected in employer uptake and workplace safety capability. Employers value these certificates as evidence of readiness to work safely around high-voltage systems, even without a legal mandate, and the stackable design supports incremental competence development alongside work.

Across all three, systematic impact measurement remains limited. Strengthening data collection on participation, completion, and labour market outcomes - and linking this to skills intelligence and provider QA processes - would improve evidence for policy and scaling decisions.

3.6 Emerging skills needs and gaps

The Portuguese automotive maintenance and repair (M&R) sector is undergoing a **profound transformation** driven by the **green transition** (electrification, sustainability regulations) and the **digital transition** (connectivity, data-driven diagnostics). This dual shift is generating **new occupations, redefined roles, and critical skills shortages**. Reliable labour market intelligence (LMI) is therefore essential for anticipating needs and adapting training pathways. Microcredentials can play a pivotal role in closing these gaps if they are aligned to up-to-date intelligence, embedded in quality assurance systems, and accessible to a wide range of learners.

3.6.1 Skills gaps and mismatches

The three case studies highlight a set of immediate, practice-oriented skills needs that are already shaping micro-credential-type provision in Portuguese automotive M&R:

Green transition (electrification and environmental compliance)

- High-voltage safety and risk management for EV/HV intervention, including safe isolation procedures, use of protective equipment and adherence to manufacturer protocols (reflected in the EV/HV pathway aligned with DGUV 209-093).
- EV/HV diagnostics and maintenance, including interpretation of electrical schematics and the use of diagnostic measurement tools (progression from safety-focused modules to diagnostic competence).
- Environmentally responsible handling of fluorinated refrigerants in vehicle air-conditioning systems, including recovery procedures and regulatory compliance (regulated attestation model).

3.6.2 Emerging occupations versus technological specialisations

Technological change is giving rise both to new occupational roles and to increasing specialisation within existing professions. In many cases, microcredentials focus on narrow technological competences rather than on complete occupational profiles, raising questions about long-term employability and progression.

Current micro-credential-type offers tend to position themselves within:

- **Emerging occupations:** EV technician, battery specialist, automotive cybersecurity technician, digital diagnostics analyst.
- **Technological/specialist skills:** use of specific diagnostic software, sensor calibration, EV charging systems.
- Most MCs focus on **tool-specific competences** (e.g., how to operate an OEM diagnostic platform) rather than broader occupational profiles. This raises questions about stackability and long-term employability.

3.6.3 Gaps in existing training provision

Despite ongoing efforts to update curricula and expand modular training, important gaps remain in the coverage, accessibility and responsiveness of existing provision. These gaps are particularly visible in relation to regional availability, SME participation and the inclusion of certain learner groups:

- **Outdated curricula:** Many VET programmes still emphasise combustion engines and manual repair techniques. Updating processes are slow compared to technological change.
- **Regional disparities:** Training for EV repair is concentrated in Lisbon/Porto, with **underserved interior regions** facing long travel times or a lack of provision.
- **Underserved groups:** SMEs (which dominate the sector) have lower participation rates due to cost, time constraints, and limited HR capacity. Older workers are particularly at risk of exclusion from reskilling initiatives.

3.6.4 Sources of labour market information and intelligence

Effective alignment between training provision and skills demand depends on the availability and use of reliable labour market intelligence. In Portugal, multiple national and European sources provide relevant data, but their integration into training design and updating processes is uneven.

Below it's a review of the main sources of labour market information currently informing skills development in the automotive M&R sector and highlights their respective strengths and limitations:

National sources:

- IEFP (Instituto do Emprego e Formação Profissional) gathers vacancy data and skills forecasts, though often aggregated and not sector-specific enough.
- ANQEP (National Agency for Qualifications and VET) operates the National Catalogue of Qualifications, which is periodically updated but slower to integrate emerging skills.

European sources:

- Cedefop skills forecasts, ESCO taxonomy, EU Pact for Skills data.

- Sectoral Skills Alliances (e.g., Automotive Skills Alliance) produce sector-focused analyses.

Employer input: OEM academies, automotive associations (ACAP in Portugal), and chambers of commerce provide direct signals of needs.

Foresight projects: EU-funded projects (e.g., DRIVES, ALBATTIS) generate scenarios on EV/battery skills.

Limitations: Data is fragmented, not always real-time, and employer feedback mechanisms are informal. SMEs' needs are underrepresented compared to OEMs.

3.6.5 Barriers to access and responsiveness

Even where relevant training exists, various barriers can limit access and reduce responsiveness to emerging needs. These barriers may be financial, organisational or logistical, and they tend to affect SMEs and adult learners most strongly:

- **Cost and funding gaps:** MCs are often not subsidised for SMEs, limiting uptake.
- **Delivery inflexibility:** Hands-on training is essential for EV/battery work, but online-only formats cannot replace workshop practice.
- **Low awareness:** Many employers and workers remain unaware of MC opportunities, especially those outside higher education.
- **Slow content renewal:** Updates to formal curricula lag behind technology cycles; while MCs are more flexible, not all providers systematically update offers.

3.6.6 Mechanisms for content renewal

Given the pace of technological change, mechanisms for regularly updating training content are essential. The main mechanisms currently used to update micro-credential-type provision are:

- **Employer validation:** Some HEIs and VET providers co-develop MCs with industry councils.
- **Learner feedback:** Limited but growing use of digital surveys to adapt content.
- **Labour market data:** Not yet systematically integrated into microcredential design.
- **Sector updates:** OEMs and automotive associations provide the most dynamic updates, though these may focus on proprietary tools rather than general competencies.

3.6.7 Alignment of MCs with labour market trends

The degree to which microcredentials are aligned with broader labour market trends varies depending on provider type, governance model and sectoral engagement. Strong alignment enhances relevance and uptake, while weak alignment risks reducing microcredentials to isolated training events.

The points that follow assess how well existing micro-credential-type provision corresponds to observed labour market trends and where further alignment is needed:

- **Higher education providers:** tend to align MCs with broad, transversal skills (digital, sustainability awareness), linked to EU frameworks.
- **Private/OEM academies:** highly responsive to immediate technological trends (e.g., EV charging, diagnostics), but less concerned with stackability or NQF alignment.
- **Public VET providers:** slower to adapt but increasingly experimenting with modular MCs integrated into the national catalogue.
- **Comparability:** Lack of a shared standard or national registry means learners cannot easily compare or stack MCs across providers.

3.7 Challenges, opportunities and recommendations

Building on the analysis of policy frameworks, stakeholder dynamics, provision models, effectiveness and emerging skills needs, this chapter consolidates the **key systemic challenges**, identifies **realistic opportunities for scale-up**, and sets out **targeted recommendations** to strengthen the role of micro-credential-type provision in Portugal. Rather than treating microcredentials as a standalone innovation, this chapter frames them as a **connective mechanism** within existing VET, CVET and sectoral ecosystems, particularly in the automotive maintenance and repair sector.

3.7.1 Key challenges

The analysis reveals that Portugal's main challenges in relation to microcredentials are **structural rather than conceptual**. The country already delivers a wide range of short, modular and outcome-oriented training that functions in practice as micro-credential-type provision. However, these offers are embedded in **parallel governance logics** — formal qualifications, regulated attestations and non-formal vocational upskilling pathways — that remain weakly connected.

Key challenges arise from the **absence of a unified national framework** defining what constitutes a microcredential, how it should be quality-assured, and how it can be recognised across contexts. This results in fragmented recognition, uneven portability and limited stackability, particularly between formal and non-formal provision. Differences in quality assurance regimes and standards-setting practices further affect employer trust and learner transparency.

On the supply side, public VET providers and HEIs face **institutional and incentive constraints** that limit systematic engagement with short-cycle credentials, while private and employer-led provision remains unevenly visible within national systems. On the demand side, SMEs — which dominate the automotive M&R sector — encounter barriers related to cost, time, limited HR capacity and uncertainty about the progression value of non-formal certificates.

Finally, the responsiveness of micro-credential-type provision is constrained by **fragmented skills intelligence and slow feedback loops**, particularly in fast-evolving domains such as EV/HV technologies, diagnostics and compliance-related competences.

3.7.2 Opportunities for scale-up and system integration

Despite these challenges, Portugal is well positioned to **scale and systematise micro-credential-type provision** by building on existing strengths rather than creating parallel structures. The NQF, CNQ and adult learning instruments already provide a solid backbone for outcome-based learning and level referencing, while national digital systems (e.g. SIGO and Passaporte Qualifica) support traceability of certified learning.

At European level, alignment with the **Council Recommendation on Microcredentials**, ESCO taxonomy and emerging digital credential standards (EDCI) offers a clear pathway towards greater transparency and interoperability. EU-funded initiatives and the Recovery and Resilience Plan provide both financial resources and experimentation spaces for piloting new governance and delivery models.

Sectoral engagement represents a particularly strong opportunity. The automotive M&R case studies illustrate how **formal qualifications, regulated attestations and market-driven non-formal vocational upskilling pathways** can each play a complementary role in addressing green and digital transition skills. Strengthening the role of sectoral bodies and employer co-design — while extending participation beyond large firms to SMEs — could significantly enhance relevance and uptake.

Digital credentialing tools, modular funding approaches and regional or sectoral pilots also create opportunities to improve visibility, access and progression, especially for adult learners and workers in transition..

3.7.3 Recommendations

To move towards a more coherent and sustainable microcredential ecosystem, policy and implementation efforts should focus on **connecting what already exists**, rather than replacing current instruments.

At policy level, Portugal should establish **shared national criteria for microcredentials**, covering learning outcomes, workload, assessment, quality conditions and — where feasible — NQF referencing. These criteria should apply across formal, regulated and non-formal provision, enabling comparability without undermining sector-specific requirements. The creation of a **national registry or portal** that transparently presents recognised microcredentials — including regulated and sector-certified short courses — would significantly enhance visibility and trust.

From a system perspective, **quality assurance and metadata standards** adapted to short, modular learning should be developed, building on existing HE and VET QA frameworks. Clearer mechanisms for credit accumulation and progression, including links to CNQ units and formal qualifications, would improve stackability and learner guidance.

At provider and sectoral level, targeted **capacity-building and funding incentives** are needed to support the design of modular, learner-centred and industry-relevant microcredentials, particularly within public VET and HEIs. Stronger and more systematic employer involvement — mediated by sectoral councils and associations — should be promoted to ensure labour market relevance while safeguarding transparency and equity.

Finally, widening participation requires measures that address **SME and adult learner constraints**, including modular funding schemes, flexible delivery models and improved guidance. Strengthening skills intelligence integration and accelerating content renewal in fast-changing domains will be critical if micro-credential-type provision is to become a stable pillar of Portugal's automotive upskilling and reskilling strategy.