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Platform for Electrification Skills & Competences

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P4ELECS WP8
Co-creating Skills Ecosystems for Electrification in Europe

System Mapping Results from Belgium

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GLOSSARY

BB Building Block. Piece of educational material, consisting of elements (reader, PowerPoint presentation, video, exercises, self-assessment with answer keys, …) related to a particular question or topic.

BBP Building Block Platform. BBP is hosted by Xdemia.

CDIO Conceive, Design, Implement, Operate. Based on the CDIO initiative of MIT.

HEI Higher Education Institutes.

SESCO Skills Ecosystem Coordinator. Individual supporting the establishment of a skills ecosystem, a collaboration between education, government, industry and research to support learners and employees in acquiring requested skills (skills intelligence) and competences.

SPIDER CDIO map that contains BBs relevant to the topic of the spider

1. Context

Scope and evidence base.

This analysis draws on eight semi-structured interviews with Flemish stakeholders — an industry/technology federation, the public employment service, an innovation cluster, an early-stage climate-tech investor, universities and university colleges, a large industrial employer and a neutral knowledge broker for installers. The findings therefore describe the Flemish ecosystem (BE: Flanders–Limburg–Genk) and should be extended to Belgium as a whole only with caution, since formal education is a regional competence.

Despite being a very advanced ecosystem, the main challenge in Belgium seemed linked to the ecosystem development itself and where to go next. There is a **lack of a coherent strategy** at national level with shared roadmaps, many actors doing overlapping things, competition without integration, knowledge dispersal with no entry point for high-quality training available, all mirrored by fundings models that do not support collaboration.

Interviewed stakeholders view innovation in the electrification sector as partly hampered by this lack of coherence across strategic planning, funding mechanisms, and collaboration patterns within the skills ecosystem.

The **skills gap** for electrification in Belgium is influenced by a combination of structural issues, labour shortages, misalignment between education and industry needs, and institutional barriers stemming from competition and traditional mindsets, specifically:

- demand is surging, supply is thin: acute shortages of site-ready technicians and industrial electricians, particularly at EQF 5–6.
- training is fragmented: many vendor/product courses, limited system-integration learning across PV, heat pumps, EV charging, storage and BMS.
- practice capacity is tight: not enough up-to-date labs/equipment/instructors; companies often have to reteach basics on the job.
- SMEs dominate the installation sector: difficult to host cohorts and organise side-entry at scale.
- motivation and adoption matter: workers' preferences and career pathways shape reskilling outcomes as much as content.
- industrial crises have shaped the policy and collaboration framework in the past supporting innovation; now new economic challenges have to be faced, like increased energy costs and investments to face climate risks, switching of fundings to other sectors, ...

2. Values and Opportunities already available

The ecosystem benefits from established networks and institutional structures that foster collaboration but not an effective coordination:

- **Strong Industry-Academic links:** Effective collaboration mechanisms exist between industry and higher education providers to develop comprehensive, long-duration programs on specialized topics like battery systems and energy management. This approach combines academic expertise with insights from industry practitioners, often featuring evening/late afternoon sessions and company visits to accommodate working professionals.
- **Presence of innovation and research hubs:** The skills ecosystem focuses on areas tied to major research centres, including DC technology and general topics researched at Energyville. Furthermore, regions that faced crises have successfully established collaborations, created as a direct result of large job losses (e.g., the closing of Ford Genk) to generate new jobs in technical sectors. There is a good share of knowledge for innovation state of the art (not for training!).
- **Funding and structural support:** universities can leverage Tech Transfer Offices established decades ago, which provide legal and expert support to professors engaging with companies, assisting in areas like Intellectual Property Rights (IPR) management and the creation of spin-offs. Government schemes also support this collaboration, for instance, by splitting the salary cost (half government, half company) for PhD students working with industry. Innovation ecosystem actors support consortia of innovative companies to submit proposals for fundings.
- **Expertise in Industry training:** Large industrial employers run their own advanced, customised training programs, including dedicated schools (e.g., a training centre in the harbour of Antwerp) and mobile training vans, to ensure their workers meet high safety and technical standards (e.g., for nuclear or high-voltage work).
- **Educational opportunities and balance for basics as well as specialised knowledge** – the so-called T-profile. There is flexibility in changing programs at university level and also in moving from technical to higher. The University Colleges and VET system is proactive in supporting flexible paths.
- **Positive collaboration patterns.** There is a story of joint projects between Belgium and The Netherlands and labour markets are very similar, sharing challenges and opportunities that can be addressed jointly. In many formal or informal collaborative relationships, unstructured decision making leaves more space for out-of-the-box thinking giving way to very fruitful collaborative projects.

3. Existing Roles within the Flemish Ecosystem

We mapped the unique value proposition that people interviewed identified for their organisation within the skills ecosystem, as we – the interviewers – understood it. It is not the sole role of the organisation involved, nor are they the only ones in the ecosystem to provide this function, but it is the role with most developmental/innovation/systemic/mission potential in our interpretation. Roles do not describe organisations throughout, but they highlight functions in the ecosystems that other ecosystems could lack, thus being of inspiration.

3.1 Supporter of Life long learning

This role aims at breaking down "silos" between universities, university colleges, and vocational schools. Key aspects of its approach include:

- **Structural Alignment:** Having representatives from different educational levels sit on each other's programme committees to align curricula and better understand specific skill needs.
- **Flexible Pathways:** Creating seamless transitions for students to move from professional bachelors to academic masters by bridging gaps in fundamental knowledge.
- **Knowledge Transfer:** "Trickling down" research-driven novelties from universities to lower educational levels to ensure all students are prepared for future technological shifts.
- **Reciprocal Sabbaticals:** Exchanging experts between universities and industry to share practical expertise and provide role models for students.
- **Continuous Learning:** Shifting education from a "discontinuous" event to a lifelong ecosystem where industry contact begins on "day one" of study.

3.2 Innovation risk taker

As a leader and primary risk-taker, specifically within the domain of early-stage climate tech and industrial ventures, their role is defined by a willingness to invest in areas with the highest risk profiles and the most difficult challenges for decarbonisation. As a "first believer," they provide the initial capital and "venture value-added services" necessary to decarbonise heavy industry. A key part of their strategy involves embedding top talent from their specialised Master's programs directly into their portfolio of startups to address labour shortages. Finally, they use systemic innovation roadmaps to align technical goals with the "just-in-time" training of essential skills.

3.3 Director/facilitator of the labour market orchestra

The organisation acts as the "director of the labour market orchestra" by coordinating a vast ecosystem of partners rather than being a solitary actor. Its core mission is to "put everyone in motion," providing citizens with career perspectives and employers with access to talent through:

- **Sectoral Coordination:** The organisation is structured into several sectoral clusters (such as industry and construction), where experts maintain a constant dialogue with sector federations to ensure training is specifically fitted to labour market needs.
- **Skills Intelligence:** It produces the official annual "bottleneck professional list," using statistical analysis and sector feedback to drive policy decisions and determine which training courses are prioritised.
- **Collaborative Hubs:** It co-manages facilities like the T2 campus, a shared technical training hub created to recover from industrial crises by preparing workers for future-oriented sectors.
- **Mediation and Certification:** The organisation mediates between job seekers and employers while recognising and certifying education programmes provided by external partners at various levels (EQF 4–7).
- **Agile Industry Support:** It organises fast-track training—sometimes as short as four weeks—in direct response to urgent company shortages.

3.4 Translating sectors needs into services and policy and identifying lack of knowledge

The technology industry federation, representing approximately 2,300 companies, acts as a primary bridge between policy, industry needs, and educational services. It translates sector needs into policy through advocacy and lobbying, specifically interpreting "tsunamis" of EU regulations like the AI Act or GDPR for local impact. It identifies knowledge gaps by scraping global vacancies and using Generative AI in a "sandbox" to create predictive cluster reports. To bridge these gaps, sector representatives develop non-formal education services for rapid upskilling in emerging areas like battery systems and energy management. These programs are often co-created with universities (e.g., KU Leuven, UGent) to combine academic research with practical industry expertise. Furthermore, the federation's experts pinpoint specific ecosystem gaps by identifying where expertise exists across different universities to build targeted training bridges.

3.5 Innovation radar

The organisation functions as an innovation radar by proactively capturing technological trends and future competence needs to accelerate the energy transition in Flanders and Belgium. As a "spearhead cluster," it identifies innovations that may only enter the market in five to ten years, helping the ecosystem prepare for long-term shifts. Key aspects of this radar role include:

- **Trend and Need Analysis:** Utilizing networking activities and international exchanges to capture emerging trends and the specific innovation needs of the coming years.
- **Competence Prognosis:** Analyzing future skill requirements across entire value chains—including PV, heat pumps, and EV chargers—to identify gaps in current learning content.
- **Living Labs Strategy:** Facilitating the alignment of five regional Living Labs to demonstrate the market impact and job creation potential of new technologies.
- **Collaborative Roadmaps:** Setting out innovation roadmaps across diverse sectors (energy, building, ICT, logistics) by facilitating collaboration among quadruple helix actors.

3.6 Industry performance partner

They have experiences, use cases, facilities. The organisation acts as a performance partner by leveraging its status as one of Belgium's largest employers with 70 years of local history. Their experiences cover critical sectors including nuclear, biotech, and marine. They contribute to skills through real-world use cases, such as installing 600 MW battery systems and training customers on advanced technologies where internal expertise is lacking.

For development, they maintain specialised facilities like a dedicated welding school in the Antwerp harbour and mobile training vans for high-voltage practice. They fill gaps standard vocational campuses cannot, specifically for high-security industrial sites. To combat local labour shortages, they also train international talent from countries like Mexico and Portugal to meet specific project needs.

3.7 Knowledge disseminator for technicians/installers

The organisation fulfills its role as a neutral and independent knowledge broker by helping installers gain advanced technological expertise without being tied to specific suppliers. As a primary disseminator, the organisation provides e-learning materials and directly answers technical questions from the field. Key dissemination activities could include:

- **System Thinking Modules:** Developing training that moves beyond individual components to explain how solar panels, batteries, heat pumps, and charging poles interact as a single system.
- **Digital Tools:** Utilizing a simulation tool (developed with universities to model energy behaviour in different seasons and exploring VR/XR for safe training on high-voltage systems.
- **Community Platforms:** Creating a community hub where "side entry" talent can access training and connect with small enterprises that lack internal training resources.
- **Collaborative Research:** Participating in projects like the energy learning community (AMC-ELC) to identify and address missing skills across the Belgian and Dutch markets.

They emphasize a 50/50 theory-practice balance, ensuring that theoretical knowledge is immediately applied through simulation or hands-on laboratory work.

3.8 Practice-based higher education

The organisation is a practice-based university college that integrates education and research to serve the regional innovation ecosystem. A core strength is its reliance on guest professors from the field who teach daily industry practices, ensuring curriculum relevance and a direct link to "company life". The institution operates at multiple levels: strategically connecting with stakeholders, managing advanced post-bachelor degrees (Banaba, Bachelor post Bachelor in Advanced Business Management), and facilitating student-led junior consulting projects for companies.

The university drives regional impact by collaborating with partners (e.g., Deloitte, aviation) on real-life business cases. Beyond industry, University Colleges bridge the educational gap by fostering flexible pathways from secondary schools to international master's programmes. By focusing on learning ecosystems and "wicked problems," the university facilitates collaboration across diverse stakeholders to address societal challenges and support lifelong learning.

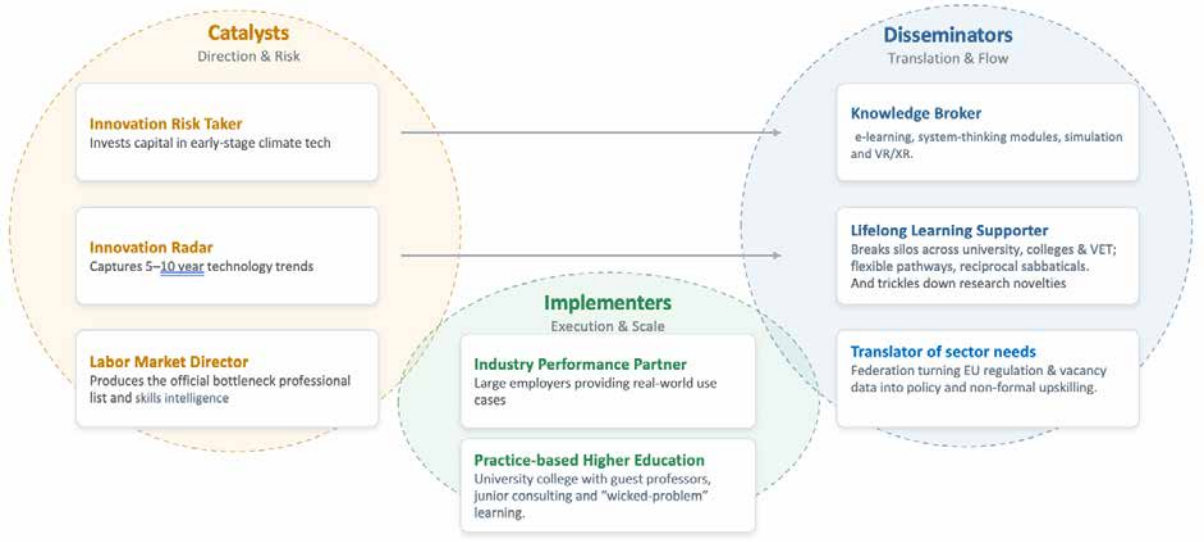

Fig.1 The eight roles identified and their systemic potential

4. Challenges and needs

The main challenges emerging for the electrification sector and, in particular, the training of its workforce in Belgium, are multifaceted, spanning workforce shortages, skills gaps, an educational ecosystem that does not support real lifelong learning opportunities, and policy misalignment. The challenges can be grouped into the following key areas:

4.1 Workforce Shortage and Recruitment

A major challenge is the fundamental lack of available people in the market for the electrification sector, including electrical installers and technical profiles. Reasons based on the interviews in BE were:

4.1.1 Scarcity and Demographics

Companies, especially large ones, are highly concerned that they will not find enough workers within the next 10 to 15 years, noting that the age profile of their workforce is moving the wrong way.

- Due to the labour shortage, there is a recognized necessity to pull people from outside the sector (known as "side entrance" or "lateral entry") who have no prior technical background.
- Reskilling fails if roles/lifestyles misalign. It is recommended to Include societal challenges to training design and collaborate more with local authorities and policy.

4.1.2 Difficulty in Attracting Young Talent

Companies observe that young people are more difficult to recruit now compared to the past, requiring more effort and investment to bring them up to the required speed.

- Younger individuals are often driven by sustainability and making a better world, but they also require that expected lifestyles are considered
- Motivate young learners: Teachers as bridge figures to connect; context-based interventions help motivation since making an impact at local level is one of the strongest levers.

4.1.3 Labour Mobility and Language Barriers

- Significant roadblocks exist in integrating international and non-working populations. Companies must spend time and money dealing with lawyers and offices to obtain working permits, as Europe lacks a unified working visa system.
- Furthermore, language is a recurring issue, as engineers may need to communicate with factory workers who do not speak English.

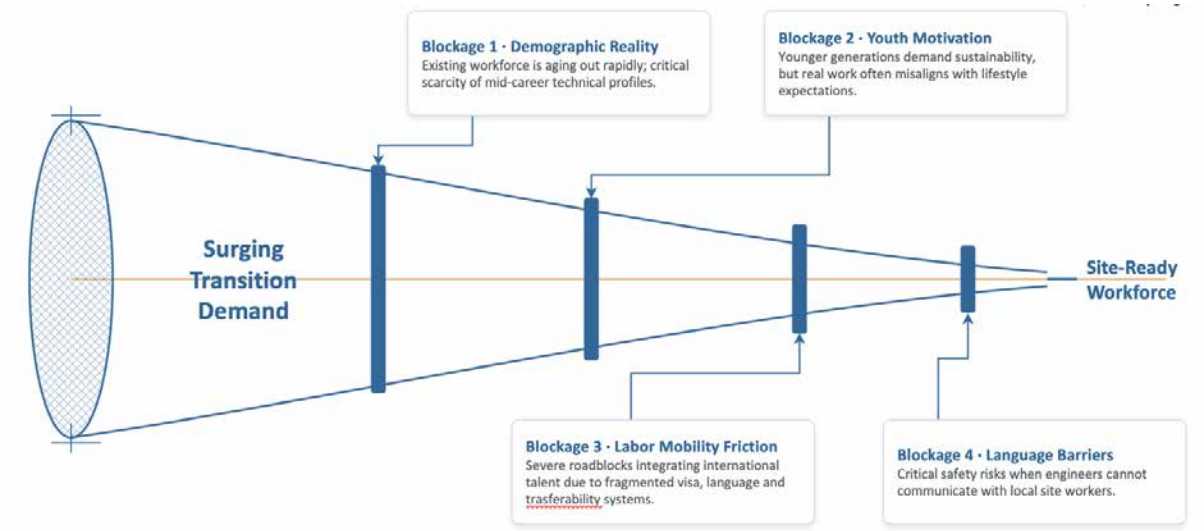

Fig.2 Surging demand, thinning supply

4.2 Training and Skills Gaps

The available training often fails to meet the specific needs of the rapidly evolving industry, leading to competency gaps. Factors must be sought in:

4.2.1 Lack of Basic Skills

New employees often lack basic knowledge and essential hands-on skills, requiring companies to make substantial investments to bring them up to speed. Many smaller companies often send blue-collar workers out to sites without any education or training, even for high-power cabling, leading to the risk of damage or serious accidents.

4.2.2 Fragmented curricula and missing "System Thinking"

A critical skill gap is the lack of education focusing on the overall solution or system thinking (e.g., integrating heat pumps, solar panels, batteries, and charging poles). Installers need to be able to ask the right critical questions about a client's specific setup to understand the entire system's complexity.

4.2.3 Lack of depth and skills mismatch

- Existing vocational training facilities and resources (such as T2 Campus, which focuses on levels 3 and 4) are perceived by large companies as having a standard that is "not high enough" for industrial, high-security, or nuclear sites where specific high-voltage training and welding certificates are required.
- There is a skills mismatch at EQF 5–6. Industrial sites require medium/high-voltage, commissioning and safety competences.

4.2.4 Insufficient hands-on learning and experience/infrastructures

- Increased availability of training must include substantial practical, hands-on components. Labs and infrastructures should scale beyond single-organisation level or medium complexity and address also the need for large infrastructures.
- Some training centres (like T2 Campus) are perceived as brilliant, but under-utilized by higher education institutions, which prefer to develop facilities in city centres or build their own, leading to wasted infrastructure.
- For installation technicians (Level 4/5), training must be highly practical; they drop out quickly if content is not sufficiently "hands-on". The 50% theoretical / 50% practical balance is emphasized, as purely theoretical instruction does not work for these profiles.
- 4. Knowledge Translation & Accessibility: There is a need to translate complicated content into more understandable content: "*we need actors beyond universities to translate into a simpler content".*

4.2.5 Lack of experts/trainers and train for trainers

- Lack of exchanges between trainers/teachers across EQFs and sectors, and lack of HEI-VET communication: more engineers should teach also in higher education instead of going only into industry, more higher educators should also teach in VET schools, HEIs and VETs should both be represented in study programme committees to influence course development, and research and higher education should also tell high schools what their work is about to inspire new learners.
- Differences in salaries between education and industry create a void of experts in training.

4.3 Structural and Ecosystem Challenges

Collaboration and a unified vision across Belgium's complex landscape are hampered by fragmentation and conflicting interests.

4.3.1 Innovation and the adoption gap

A recurring, systemic message from interviewees is that in the Flemish/Belgian context innovation is not the main bottleneck — adoption is. An over-emphasis on innovation (described by one stakeholder as an "innovation circus") can attract media attention and funding while diverting focus from the skills ecosystem needed to put new technology to work. Reskilling plans frequently overlook worker preferences and job realities, such as reluctance to move from combustion-engine work to EV or offshore-wind roles. Stakeholders argue that coherence should start from a validated innovation roadmap, co-developed by quadruple-helix actors (policy, research, academia, industry, start-ups), which then dictates the research projects and the just-in-time skills to be trained.

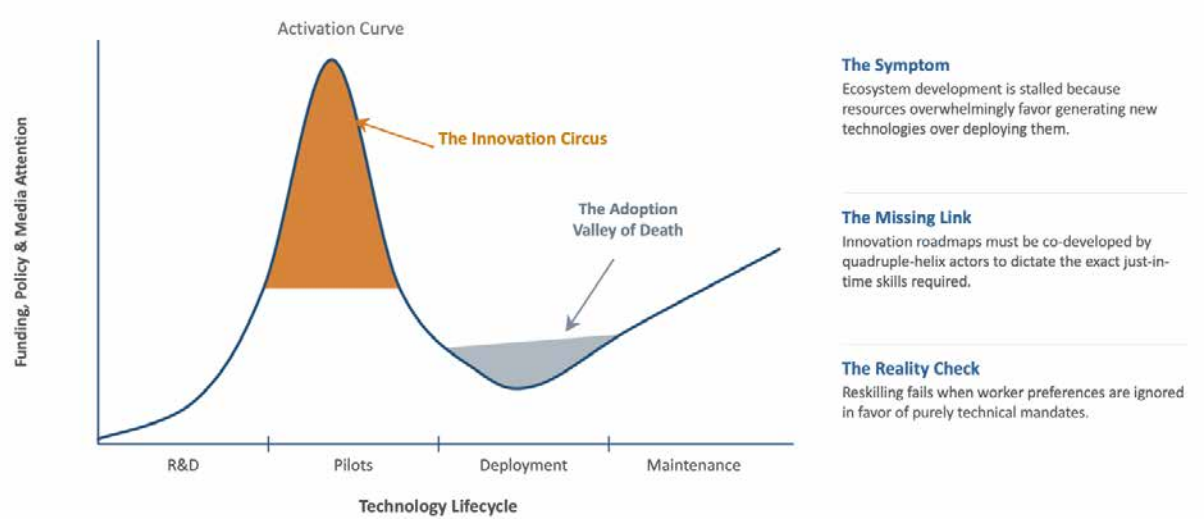

Fig.3 Innovation Circus vs Adoption

4.3.2 Lack of Coherent Strategy

There is no overall governmental strategy on skills and competences in Belgium. Formal education is a regional responsibility, which adds complexity.

4.3.3 Siloed and Scattered Landscape

- Too many actors do overlapping work. This leads to competition and initiatives dying in silence due to insufficient funding for sustaining or communicating successful outcomes (e.g. skills intelligence).
- Lack of formal cooperation between universities, university colleges and VET.
- A strong consensus exists on the need to formally link universities, university colleges, and VET schools, potentially by having representatives from each level participate in the others' program committees, to create clearer, flexible pathways for learners. Also informal coordination and networking is recognised as important to develop lateral thinking and out-of-the-box solutions.
- Competition in Academia: There is strong competition among Belgian universities, often leading to scattered resources where multiple institutions build up the same expertise as well as infrastructures in close proximity. Overcoming this "useless competition" and encouraging collaboration between universities and university colleges remains a challenge, not facilitated by the funding system.

- Dispersed Knowledge: Companies (especially installers) often do not know which training opportunities are available, and there is no common portal or single point of entry to find the necessary educational materials.

4.3.4 Need for an Adaptive mindset

- Many industry leaders still adhere to traditional hiring based on formal degrees (bachelor or master) and are resistant to accepting non-formal lifelong learning credentials, creating a gap between the desired hiring profile and the urgent need for reskilling and upskilling. Large industries are often self-reliant, not sharing their knowledge, and the wide landscape of SMEs lacks the resources to engage in structured training.
- Lifelong learning needs to be more central to our societies. Sabbatical periods and critical thinking as facilitators of lifelong learning paths.

4.4 Governance, Policy, Funding, and Infrastructure Issues

High-level policy and resource allocation present further barriers to the sector's development.

- **Policy Disconnect:** Political strategies regarding decarbonisation and industrialisation often fail to account for the necessary "essential part" of skills and people needed for implementation.
- **Financial Disincentives:** Training workers is costly, especially for small companies who fear losing trained staff to larger competitors (brain drain). This cost factor is a major barrier to implementing necessary training. Lowering training costs is necessary; e-learning could help, and diversity and informal learning should be valorised.
- **Academic Financing Model:** Fundings for Training is less appealing and the funding model for universities incentivizes obtaining additional money for research rather than training, often discouraging collaboration with other academic institutions to create structural, unified educational offerings.
- **European Funding Uncertainty:** The landscape for European project funding is changing, with projects and calls "drying up" and money potentially being redirected to defence funds, which means less future funding for skills development and increased competition.
- **Infrastructure Gaps:** There is a strong need for investments in high-quality physical space and labs where workers can receive practical training. Labs and infrastructures should scale beyond single-organisation level or medium complexity and address also the need for large infrastructures.
- Beyond structures and funding, interviewees stressed the need to shift how industry leaders behave. Lifelong learning is still often perceived as a cost rather than a driver of competitiveness. Communicating concrete success stories — "CEO A did this and achieved that" — can create a "constructive virus" that generates demand for upskilling instead of pushing offers onto reluctant audiences. Leaders should also be helped to accept that the value of formal diplomas has changed, and that non-formal, lifelong-learning credentials are now essential to meeting business objectives and staying competitive.

5. Opportunities for P4ELECS in Belgium

P4ELECS, as a training and collaboration platform at EU level, has opportunities to contribute to the Belgium Skills Ecosystem. Here we list the main areas of potential interaction and integration with the above needs and challenges.

5.1 Addressing workforce Shortage and Recruitment

With reference to the challenge linked to Workforce Shortage and Recruitment, P4ELECS can contribute to talent acquisition and Internationalisation:

1. Due to domestic labour shortages, Belgian companies are actively exploring pathways to train and integrate workers from abroad. P4ELECS is placed to be a facilitator of international exchanges and experiences that can lead to long-term work placements.

2. Motivating young talents/learners has become difficult; both impact and objectives at global level and lifestyles and standards are necessary to engage and retain them. Embed adoption and motivation levers in programmes, for example realistic job previews, progression pathways, and offshore or fieldwork exposure, to align reskilling with worker preferences flagged by InnoEnergy.

3. Develop side-entries for high-demand skills from other careers or declining sectors might be necessary. It requires feasible paths that consider both financial and social barriers.

4. Work on easy recognition of micro-credentials across institutions and with institutions abroad to facilitate circulation of learners and workers in EU.

5.2 Addressing Training and Skills Gaps

Several aspects of the challenge linked to Training and Skills Gaps can addressed within the P4ELECS activity:

1. Work on filling the gaps at EQF 5–6, both in terms of content and courses, through specific Building Blocks and experiential courses (like Blended Intensive Programs) developed with the collaboration of both HEIs, VET and Industry.

2. Within spiders, it is possible to start reflections based on innovative or alternative models and frameworks (e.g. Kees Klomp Value Economy). Developing modules focused on system thinking that cross domains is crucial, as current education often lacks this holistic, integrative approach.

3. P4ELECS is improving the educational and experiential approaches to training and there is a high potential for using virtual reality (VR) or extended reality (XR) tools to provide scalable, safe, and realistic "hands-on" training scenarios, which could reduce the time required in expensive physical labs.

4. Centralise access to available knowledge and standardise it through the Quality Guidelines and peer reviews processes that P4ELECS has develop is challenging, but it could prove very useful to the ecosystem. This should be coupled with an innovative way to involve industry in training and create sharing opportunities that do not threaten IPR.

5.3 Addressing Structural and Ecosystem Challenges

1. There is a recognized need to overcome the "scattered landscape" of many actors doing overlapping work. A significant opportunity lies in providing inputs for an overall strategy for Belgium on skills and competences. Locally, actors need to work toward shared, long-term common goals and ensure complementary, rather than duplicate, efforts. Co-creating innovation roadmaps and skills strategies that include societal — not only economical or technological — objectives is necessary and will prevent pitfalls. P4ELECS is able to provide a process, experiences and existing and new collaborations that can be valuable inputs in this sense, especially where some aspects could be addressed in an interregional and transnational perspective. It can also foster exchanges between sectors (research, HEIs, VETs, Industry) starting from experts, teachers and trainers and foster informal networking opportunities especially in