Learner Centric Advanced Manufacturing Platform

Digital Technologies 4.0 and the Impact of the Green Transition on Predictive Maintenance Insights from the LCAMP Observatory in Slovenia

WP3 – Observatory – M48 – Final report

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EXECUTIVE SLOVENIA COUNTRY SUMMARY

This report summarises the findings of two end-of-project surveys conducted within the LCAMP initiative in Slovenia: one among Higher Vocational Colleges (HVCs) and one among companies. The surveys aimed to assess current cooperation between education and industry, identify emerging competence needs and evaluate readiness for digital and green transitions. Nine out of ten higher vocational colleges and two out of ten companies responded.

The results demonstrate a strong and consistent recognition of the growing importance of **hybrid competences** that combine technical, digital and green skills. Higher vocational colleges report increasing integration of digital technologies and sustainability-related content into their curricula, while companies confirm rising demand for graduates capable of working with modern production technologies, data-driven systems and sustainable practices. These findings are fully aligned with previous Slovenian LCAMP Observatory analyses.

At the same time, **staffing shortages emerge as the most significant structural barrier** across both sectors. Higher vocational colleges report a lack of teachers with advanced technological expertise, while companies highlight insufficient personnel and limited time for cooperation and training activities. These constraints hinder deeper collaboration and slow the adoption of new technologies, confirming patterns already identified in earlier Slovenian Supply Chain Management (SCM) and predictive maintenance (PdM) reports.

Differences persist in the **perception of cooperation**. Colleges generally view collaboration with companies as stable or moderately improving, whereas companies report a decline in cooperation over the past three years, primarily due to workload pressures, staffing limitations and operational priorities. This divergence reflects differing institutional realities rather than a lack of shared strategic objectives.

Awareness and engagement with **LCAMP services** remain uneven. Several higher vocational colleges report partial familiarity or limited use of LCAMP tools, while companies are largely unfamiliar with the platform, indicating a clear need for more targeted outreach and communication toward industry stakeholders.

The findings related to **micro-credentials** further illustrate Slovenia's transitional position. While other LCAMP partner countries already implement micro-credentials at EQF level 5, Slovenia is still in the process of establishing the legislative framework for short-cycle higher vocational education. Higher vocational colleges recognise the potential of micro-credentials but face resource and staffing constraints, while companies express conditional interest depending on relevance and feasibility.

Overall, the surveys confirm **strong strategic alignment with European priorities in advanced manufacturing**, particularly in relation to digitalisation, sustainability and hybrid competence development. However, operational implementation remains limited by systemic constraints, including human-resource shortages, uneven cooperation capacity and an evolving regulatory environment. These findings highlight the need to address structural barriers to strengthen Slovenia's capacity for advanced manufacturing transformation.

1. INTRODUCTION

This report presents an analysis of targeted end-of-project surveys conducted in Slovenia within the framework of the LCAMP (Learner-Centric Advanced Manufacturing Platform) project. Over the three-year implementation period, LCAMP partners developed and applied a structured Observatory methodology to support continuous monitoring of trends, skills needs and cooperation models relevant to advanced manufacturing.

The field of observation has **not been changed**, but rather **further specified and analytically deepened**. While earlier LCAMP Observatory work focused on the *validation of hybrid skills needs in SMEs*, particularly across maintenance, CNC, automation and quality profiles, the present report *"Digital technologies 4.0 and green transition impacts on predictive maintenance"* represents a **thematic continuation and refinement** of this work. Predictive maintenance was already addressed in the M36 report; however, the M48 report builds on these earlier findings and expands them through end-of-project surveys, updated analysis of Industry 4.0 and green transition impacts, and a more focused examination of competence implications related to predictive maintenance. In this sense, the scope reflects a logical progression of the LCAMP Observatory work rather than a shift in focus, and the length of the report corresponds to its role as a **final synthesis document**.

The questionnaire used in the Slovenian surveys was developed based on:

- insights from previous annual LCAMP Observatory reports,
- findings from expert validation meetings,
- baseline questions formulated at the beginning of the project,
- and recurrent themes identified throughout the three-year LCAMP implementation cycle, including skills needs, industry cooperation, hybrid profiles and technological transitions.

A total of ten Higher Vocational Colleges were invited to participate, of which nine completed the questionnaire, resulting in a 90% response rate. The primary aim of the survey was to collect up-to-date evidence on the strengths and weaknesses of current cooperation between education and industry, the challenges faced by higher vocational colleges, and emerging competence needs of both institutions and companies—particularly in relation to hybrid competences combining technical, digital and green dimensions.

In addition, the survey explored perceptions of hybrid professional profiles, reflecting one of LCAMP's core strategic directions: the integration of traditional technical competences (such as CNC, automation, maintenance and quality) with modern digital competences (including IoT, data analytics and artificial intelligence) and green competences related to energy efficiency, sustainability and the circular economy. Micro-credentials were also briefly addressed, in line with ongoing European developments and the current legislative process concerning their future implementation in Slovenian higher vocational education (Council Recommendation on a European approach to micro-credentials, 2022).

The findings presented in this report contribute to the LCAMP Observatory, support comparative analysis across partner countries, and inform the further development of the LCAMP Skills Framework and associated training solutions.

2. METHODOLOGY

The methodology of this report is structured into two distinct parts, reflecting the implementation of two separate surveys conducted in Slovenia as part of the LCAMP project. The aim of this dual approach was to capture perspectives from both the education sector and the industry, thereby ensuring a comprehensive understanding of cooperation practices, emerging competence needs, and future skills priorities in advanced manufacturing.

All participating institutions were informed that their responses would be used exclusively for research and analytical purposes within the LCAMP project and processed in accordance with GDPR.

2.1. PART I - SURVEY FOR HIGHER VOCATIONAL COLLEGES

The first survey targeted Slovenian Higher Vocational Colleges and was developed based on several key inputs that evolved throughout the three-year implementation of the LCAMP project. Its design drew from LCAMP Observatory deliverables, including D3.1, D3.2 and annual scans, as well as from expert feedback gathered during national validation meetings such as the Slovenia SCM Expert Validation Meeting in 2025. The questionnaire also followed the methodological guidelines defined in the LCAMP Observatory process cycle and incorporated baseline questions formulated in the first year of the project to ensure longitudinal comparability.

The survey was distributed to ten Higher Vocational Colleges, of which nine completed the questionnaire, resulting in a 90% response rate. Closed questions were analysed using descriptive statistics, while open-ended responses were examined through thematic coding. The survey aimed to assess the strengths and weaknesses of current cooperation between schools and industry, identify organizational and pedagogical challenges, explore needs for new and emerging competences, examine expectations regarding the development of hybrid professional profiles, and capture requirements related to equipment, collaboration models and future training resources.

2.2. PART II – SURVEY FOR COMPANIES

The second survey was carried out among companies operating in sectors relevant to advanced manufacturing. It followed the same methodological principles as the survey for Higher Vocational Colleges, ensuring consistency with the LCAMP Observatory framework. The questionnaire was sent to ten companies, and two provided complete responses. While the response rate was modest, the collected data offer valuable qualitative insights into industry perspectives on cooperation with Higher Vocational Colleges, current and future skills needs, competence gaps, and expectations related to hybrid professional profiles.

Quantitative elements were analysed descriptively, and qualitative responses were examined using thematic categorization. Given the limited number of responses, the analysis focuses primarily on recurring themes and industry-relevant observations that complement the findings from the educational sector.

3. ANALYSIS OF DATA FROM HIGHER VOCATIONAL COLLEGES

The results of this report are presented in two main parts, reflecting the dual survey approach applied in the Slovenian context of the LCAMP project. The first part provides an analysis of the survey conducted among Higher Vocational Colleges, focusing on their perceptions of programme adaptation, cooperation with industry, emerging competence needs and the development of hybrid profiles. The second part presents the results of the survey carried out among companies operating in sectors relevant to advanced manufacturing, offering insights into industry views on skills gaps, collaboration practices, workforce needs and expectations regarding future competences. Each part is analysed separately and is clearly marked to ensure clarity and comparability, while the concluding discussion synthesises findings from both surveys and highlights key similarities, differences and opportunities for further alignment between education and industry.

3.1. ADAPTATION OF PROGRAMMES TO DIGITAL AND GREEN TRANSITIONS

In assessing how well educational programmes have responded to the demands of digital and green transitions over the past three years, schools were asked to what extent their curricula had been adapted during this period (n = 8). The responses show that most institutions have made at least some progress: **63% reported partial adaptation**, while an additional **25% stated that substantial progress has been achieved**. **One institution (13%)** indicated that no significant adjustments had been implemented (Figure 1).

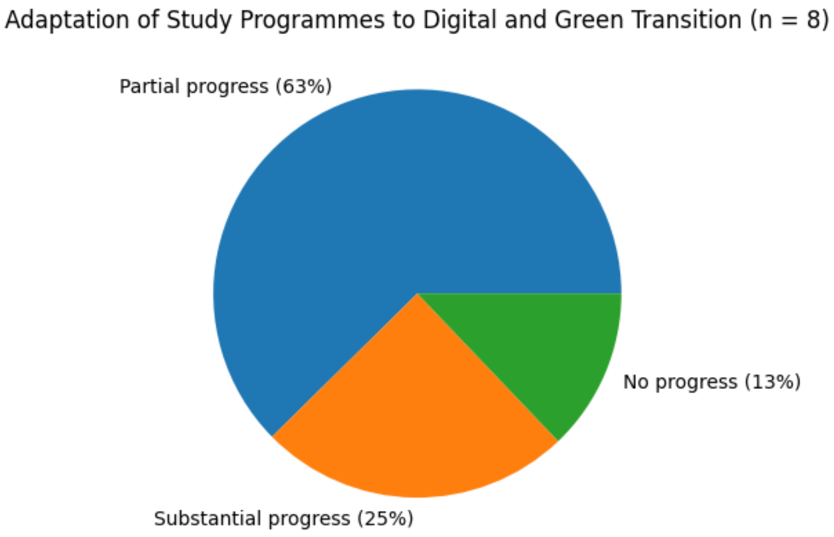

Figure 1*: Have your study programmes adapted to the needs of the digital and green transition over the past three years?*

Taken together, these findings show that Slovenian Higher Vocational Colleges are increasingly recognising and responding to the need to modernise programmes in line with emerging industry requirements. However, the distribution of responses also implies that continued support, capacity-building and targeted guidance may be needed to ensure that all institutions can advance at a comparable pace.

3.2. PREDICTIVE MAINTENANCE, IOT AND DIGITAL TOOLS

In examining the future importance of predictive maintenance, the survey asked schools to what extent they believe learners will require competences such as the use of sensors, IoT technologies and data analytics for machine maintenance (Figure 2). The responses reveal a very strong consensus (n = 9): **78% of institutions indicated that these competences will be mostly needed**, while the remaining **22% agreed that they will be needed at least partially**. No respondent considered these skills unnecessary.

This alignment reflects the broader digital transformation of industrial maintenance, where condition monitoring, connected systems and data-driven diagnostics are becoming standard practice. Overall, the findings point to a shared understanding that educational programmes will need to increasingly integrate predictive maintenance concepts, ensuring that learners are prepared for technologically advanced production environments.

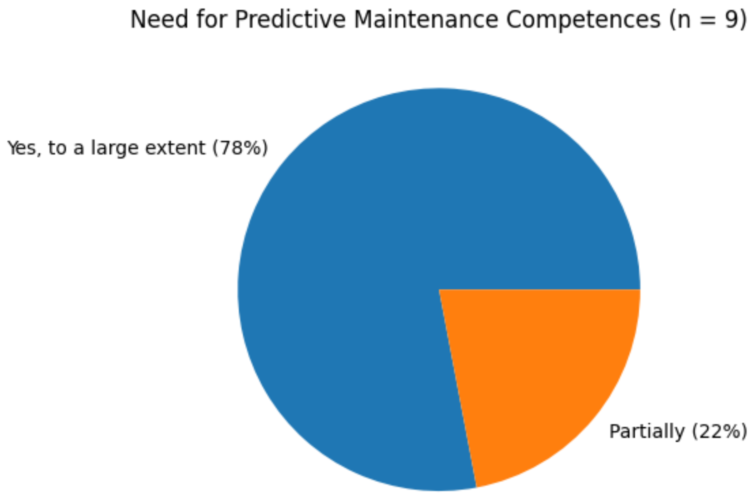

***Figure 2**: Do you believe that learners will require more knowledge in predictive maintenance (use of sensors, IoT, data analytics for machine maintenance) in the coming years?*

3.3. GREEN COMPETENCES

In examining how the importance of green competences has evolved over the past three years, schools were asked to what extent skills related to sustainability, efficient resource use and the circular economy have become more relevant in their programmes (n = 9) (Figure 3). The responses show a unanimous shift toward increased emphasis: **44% of institutions indicated that green competences have become "very important,"** while the remaining **56% stated that they have become "somewhat more important."** No school reported that the importance of green competences had remained unchanged or decreased.

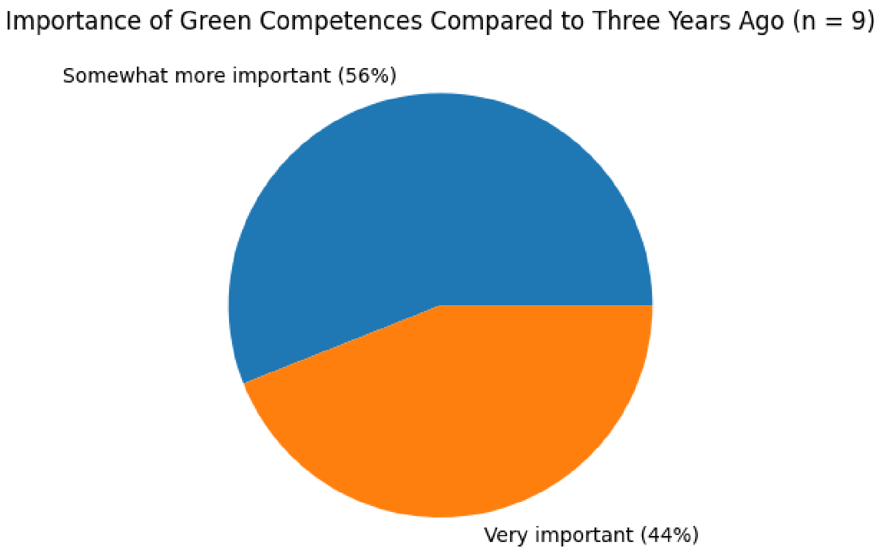

Figure 3: *How important have green competences (sustainability, efficient use of resources, circular economy) become in your programmes compared to three years ago?*

This consistent upward trend demonstrates that sustainability-related knowledge is gaining a central role in vocational programmes, driven both by regulatory developments and the growing expectations of industry partners. The alignment of all responses suggests that Higher Vocational Colleges recognise the strategic significance of green transformation and are actively integrating these elements into curricula to prepare learners for environmentally responsible and resource-efficient workplaces.

3.4. HYBRID PROFILES AND COMPETENCE NEEDS

In exploring where the need for hybrid competences—combining technical, digital and green skills—is most evident, schools were asked to indicate the learner profiles for which such blended skill sets are becoming increasingly important (n = 9, multiple responses allowed). The results highlight several clear priority areas (Figure 4). The strongest need was identified among **automation and robotics technicians**, selected by **89%** of institutions, followed by **CNC operators and machining technicians**, indicated by **78%**. These two profiles represent core technical roles where digitalisation, sensor integration, automation processes and sustainable production practices are converging most rapidly.

A moderate level of need was also reported for **maintenance technicians** and **quality control technicians**, each selected by **33%** of respondents. These findings suggest that hybrid competences are no longer limited to high-tech or engineering-driven roles but are increasingly relevant across a broader range of operational positions within modern manufacturing environments.

One respondent provided an additional open explanation under the "Other" category, specifying **automotive service activities**, indicating that hybrid competencies are also becoming essential in applied technical fields beyond traditional manufacturing, particularly where diagnostics, digital tools and sustainability aspects are gaining importance.

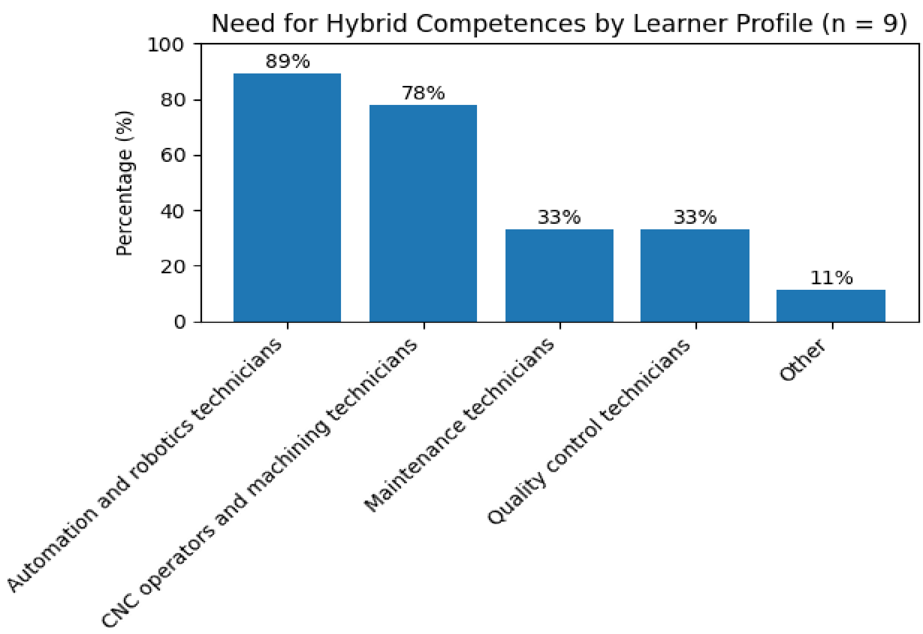

Figure 4: *For which learner profiles do you observe the greatest need for hybrid competences (technical + digital + green)? (select all that apply)*

Taken together, these results clearly demonstrate that Higher Vocational Colleges perceive hybrid profiles as a growing priority across several key technical occupations. This trend aligns with the broader transformation of industry, where roles increasingly require a combination of mechanical understanding, digital fluency and awareness of sustainable operational practices.

3.5. MICRO-CREDENTIALS AND SHORT MODULAR COURSES

3.5.1. INSTITUTIONAL INVOLVEMENT IN MICRO-CREDENTIALS

When exploring the extent to which institutions engaged in the development or delivery of micro-credentials or short modular courses during the project period, schools were asked to indicate the level of their involvement (n = 9, multiple responses allowed) (Figure 5). The results show that participation was relatively widespread, though heterogeneous in intensity. A clear majority, **67%**, reported that they were **partially involved**, while **11%** indicated **active involvement** in the development or implementation of micro-credentials. **One institution (11%)** stated that they had not participated in such activities.

One respondent selected the "Other" category and clarified that their institution had been involved, but the respondent was uncertain about the exact extent of this participation. This suggests that micro-credential initiatives may not always be fully transparent or evenly communicated within all institutions, even if activity is taking place.

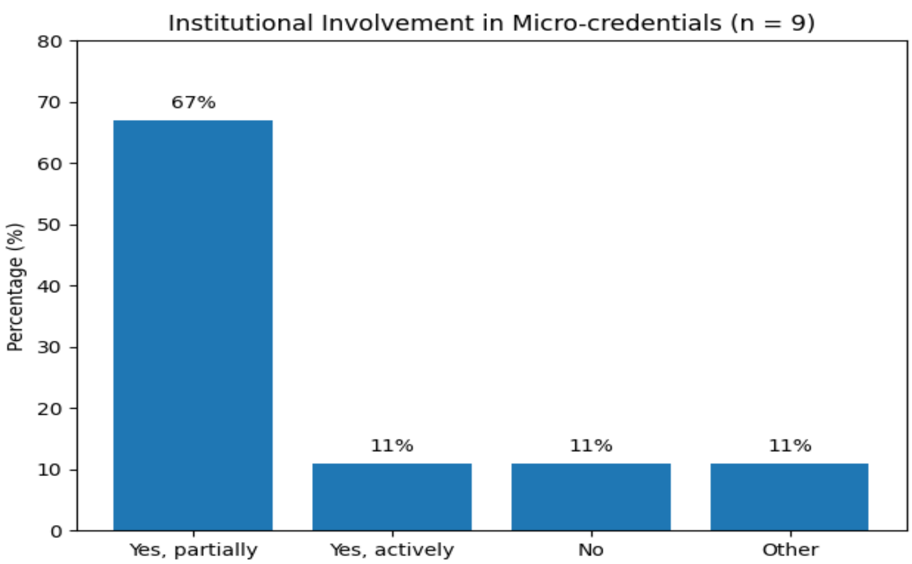

Figure 5: *Has your institution participated in the development or implementation of micro-credentials / modular short courses during the project period?*

Overall, the findings indicate that micro-credentials are gradually becoming embedded within institutional practice. While not yet widespread at full implementation level, most institutions demonstrate at least partial engagement, signalling a growing readiness to adopt modular, flexible training formats aligned with emerging labour-market needs.

3.5.2. PERCEIVED RELEVANCE OF MICRO-CREDENTIALS

To explore institutional attitudes toward the role of micro-credentials in continuous upskilling, the survey asked schools whether they consider micro-credentials and short modular programs an appropriate form of ongoing knowledge development (n = 9**)** (Figure 6). The results are clear consensus: **89%** of institutions assessed micro-credentials as **highly appropriate**, while **22%** described them as **partially appropriate**. No respondent viewed them as inappropriate.

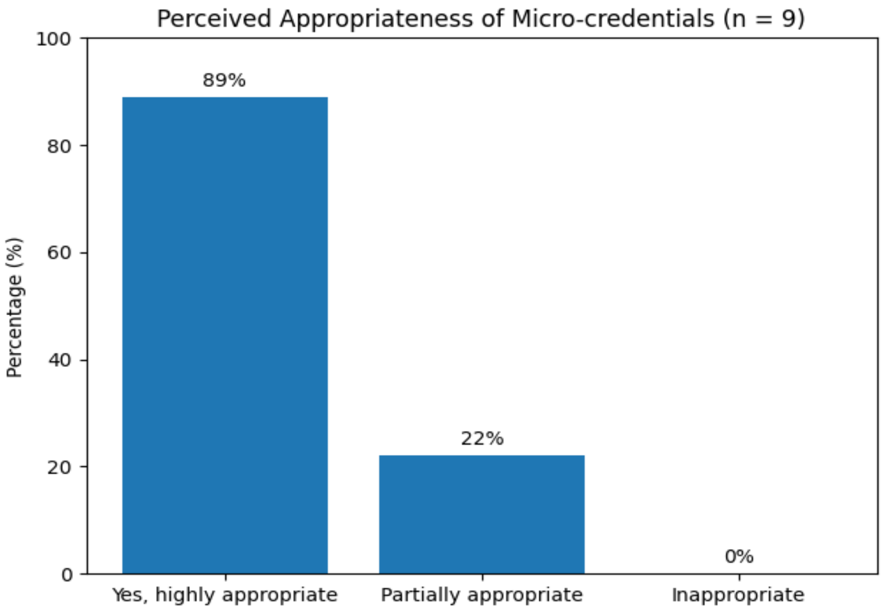

Figure 6: *Do you believe that micro-credentials / short programmes are an appropriate way to support continuous upskilling of learners and employees?*

These results reveal strong support for micro-credentials as a flexible and industry-responsive learning tool. Institutions evidently recognise their value in enabling targeted skill acquisition, rapid updating of competences and the customisation of learning pathways for both learners and employees. The strong alignment of opinions also suggests an openness to expanding such formats in the future, especially in fields undergoing rapid technological change.

3.6. DISTRIBUTION OF INSTITUTIONAL RESPONSES REGARDING STAFF READINESS FOR EMERGING TECHNOLOGIES

To assess how the readiness of teachers and mentors has evolved over the past three years, institutions were asked to evaluate the extent to which staff are now better prepared to integrate new technologies—such as IoT, artificial intelligence and data analytics—into their teaching practices (n = 9, multiple responses allowed). The responses indicate a general improvement in staff preparedness, though the degree of progress varies across institutions (Figure 7).

A combined **77%** of respondents reported improvement, with **33%** stating that preparedness has **significantly improved** and **44%** indicating that it has **partially improved**. At the same time, **22%** of institutions noted **no change** in teachers' readiness for integrating emerging technologies, suggesting that progress is not uniform across the system. Importantly, none of the respondents reported a decline in preparedness.

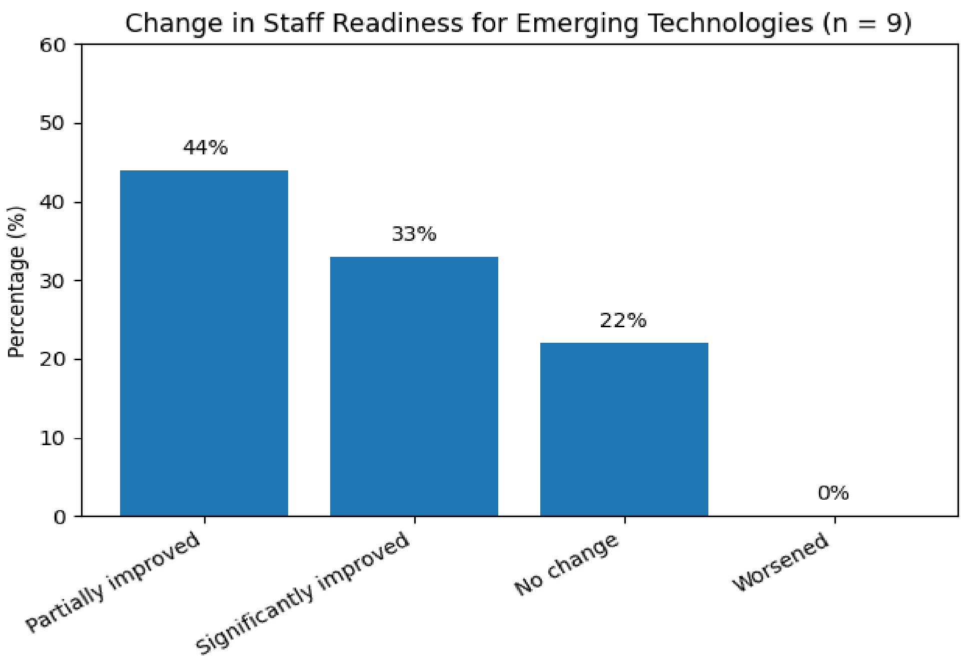

Figure 7: *How would you assess the readiness of teachers/mentors today compared to three years ago to integrate new technologies (IoT, artificial intelligence, data analytics) into teaching?*

Overall, the findings show that Higher Vocational Colleges have made notable strides in equipping teachers and mentors with the skills needed to incorporate advanced technologies into instruction. Nevertheless, the presence of institutions reporting no change highlights a continued need for targeted professional development, systematic support and structured training opportunities to ensure that all educators can effectively deliver technologically enriched learning environments.

3.7. COOPERATION WITH INDUSTRY

3.7.1. CHANGES IN COOPERATION WITH COMPANIES

To understand how collaboration between Higher Vocational Colleges and companies has evolved over the past three years, institutions were asked to assess whether cooperation related to identifying competence needs, developing modules or organising work-based learning placements has improved **(**n = 9**,** multiple responses allowed). The results show that most institutions perceive clear progress. **44%** of respondents reported that cooperation has **partially improved**, while an additional **33%** indicated that it has **significantly improved** (Figure 8).

At the same time, **22%** of institutions observed **no change** in cooperation levels, and none reported a decline. This distribution suggests that while most colleges have strengthened their engagement with companies, the enhancement is not uniform across the entire sector. For some institutions, collaboration remains stable rather than advancing.

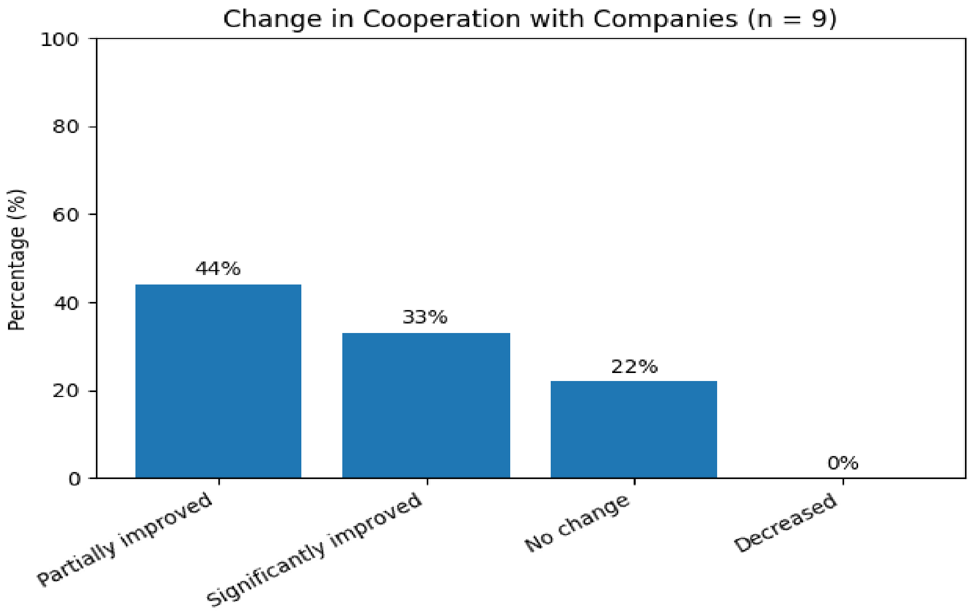

Figure 8: *How would you assess your institution's cooperation with companies/SMEs over the past three years regarding competence needs, module development, or practical training?*

Overall, the findings demonstrate a positive trend: Higher Vocational Colleges have experienced better alignment with companies in recognising competence needs, co-developing programme content and facilitating practical training. This reflects broader policy encouragement toward closer school–industry cooperation and the growing need to synchronise educational offerings with rapidly evolving workplace demands.

3.8. AWARENESS AND ENGAGEMENT WITH LCAMP SERVICES

3.8.1. AWARENESS AND USE OF LCAMP SERVICES

To understand the extent to which institutions are familiar with and have engaged with LCAMP services, schools were asked whether they had already used any of the platform's key offerings—such as the Skills and Jobs Observatory, micro-credentials, learning factories or the Innovation Community (n = 7). The results indicate that while some level of familiarity exists, actual use remains limited (Figure 9). **22%** of respondents reported having used one or more LCAMP services, while an additional **22%** stated that they were familiar with the services but had not yet used them.

33% of respondents indicated that they were **not familiar** with LCAMP services. This finding suggests that awareness of the platform is still uneven among Higher Vocational Colleges and that its potential added value may not yet be fully recognised or integrated into institutional processes.

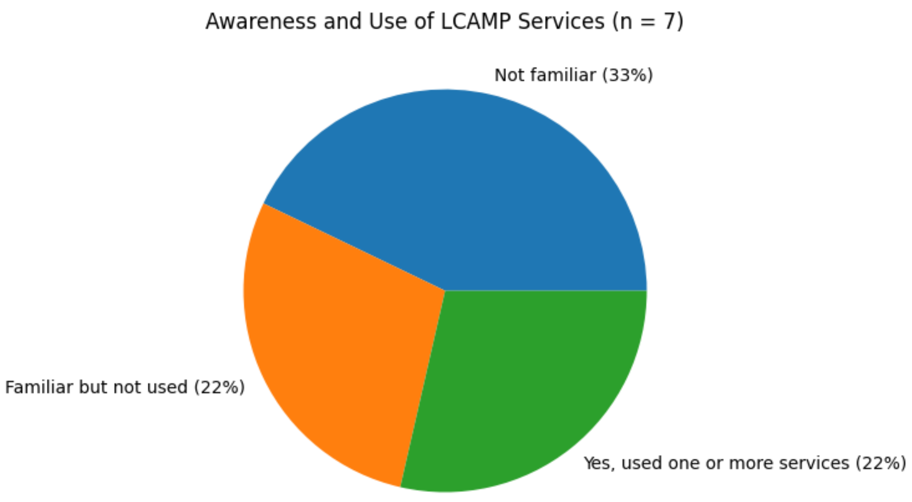

Figure 9: *LCAMP offers services such as the Skills and Jobs Observatory, micro-credentials, learning factories and the innovation community. Has your institution used any of these services?*

Overall, these results highlight a need for improved communication, outreach and practical demonstrations of LCAMP tools. Institutions that had used LCAMP services noted their usefulness, but the relatively small proportion of users underscores the importance of strengthening visibility and building confidence in the platform's relevance for both curriculum development and cooperation with industry.

3.8.2. INTEREST IN FUTURE COLLABORATION WITH LCAMP

To explore institutions' willingness to continue collaborating with LCAMP, schools were asked whether they would be interested in future engagement, such as offering modules on the platform, developing micro-credentials, participating in learning factories or using the Observatory (n = 8). The responses reveal a predominantly positive attitude: **33%** of institutions expressed clear interest in further collaboration, while an additional **44%** indicated that they would **consider participation if adequate support were provided**. **11%** stated that they were not interested in continued collaboration (Figure 10).

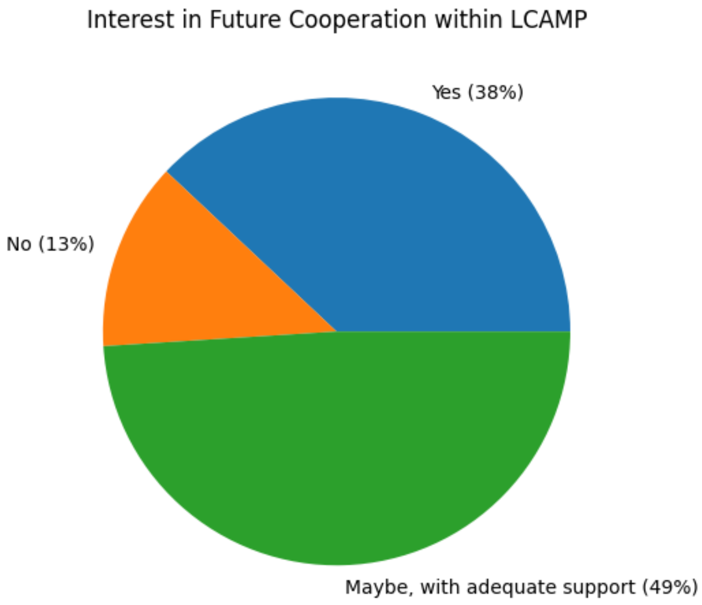

Figure 10*: Would your institution be interested in continuing cooperation within LCAMP (e.g., offering modules on the platform, developing micro-credentials, participating in a learning factory, using the Observatory)?*

The high proportion of organisations expressing interest or conditional interest suggests that LCAMP is recognised as a meaningful framework for strengthening cooperation, developing new learning opportunities and supporting innovation within vocational education. Institutions appear open to deeper engagement, particularly if future activities are accompanied by structured guidance, technical support and opportunities for capacity-building.

3.9. FUTURE SUPPORT NEEDS

3.9.1. INSTITUTIONAL SUPPORT NEEDS FOR THE FUTURE

To identify the types of support that would be most valuable for Higher Vocational Colleges in the coming years, institutions were asked to select up to two forms of assistance that would strengthen their capacity for programme development, digital and green transitions and cooperation with industry (n = 8, multiple responses allowed) (Figure 11). The results highlight several clear priority areas. The strongest needs were expressed in **teacher and mentor training on new technologies** and in the **joint development of modules or micro-credentials with companies**, each selected by **88%** of respondents. These findings indicate that institutions view staff competence development and structured collaboration with industry as essential components of future readiness.

A substantial share of respondents (**75%**) also emphasised the need for **stronger policy and financial support for programme modernisation**, reflecting the importance of systemic investment in updated equipment, new modules and the integration of emerging technologies. Additionally, **63%** of institutions indicated the need for **access to shared infrastructure or learning factories**, confirming that hands-on environments and industry-standard equipment are crucial for delivering high-quality vocational training aligned with real workplace requirements.

One institution provided an additional comment under the "Other" category, stating: *"kader, ki bo to delal"* (eng: "staff who will be able to carry out this work"). This remark highlights a structural challenge common across many institutions: even when a school recognises the importance of innovation and programme development, it may lack the dedicated human resources required to implement these activities effectively.

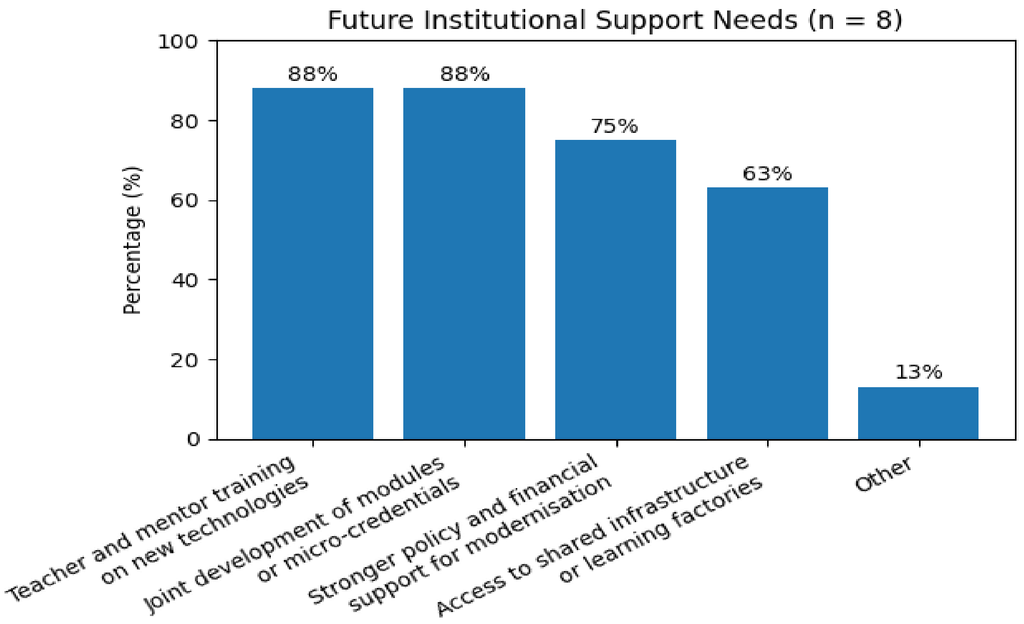

Figure 11: *Which forms of support would be most beneficial for your institution in the future?*

Overall, the findings show that institutions perceive the need for both pedagogical and systemic support. Strengthening cooperation with industry, investing in staff development and ensuring adequate infrastructure and policy backing are seen as key conditions for keeping pace with technological, organisational and educational change.

4. ANALYSIS OF DATA FROM COMPANIES

4.1. INTRODUCTION

The company survey was designed to gather insights from Slovenian employers regarding their cooperation with Higher Vocational Colleges, their needs for new competences and their expectations for future programme development. The introductory message accompanying the survey emphasised the importance of aligning education with industry needs and invited companies to share their experiences in the areas of cooperation, skill requirements and future development priorities.

The questionnaire was sent to **10 companies**, of which **2 responded**. Although the response rate was low, the collected feedback still provides valuable qualitative indications regarding the expectations and needs of companies operating in technologically advanced and rapidly evolving sectors of Slovenian industry.

4.2. COMPANY PROFILE

4.2.1. LOCATION / REGION

To provide contextual information about the respondents, companies were first asked to indicate their geographical region (**n = 2**). The two responding companies were in **Jugovzhodna Slovenija** and in the **Savinjska / Celje region**, representing two distinct industrial environments. While the sample is small, it includes companies from regions with strong manufacturing and engineering activity, which are traditionally important partners of Higher Vocational Colleges.

4.2.2. SECTOR / INDUSTRY

Companies were then asked to indicate the sector in which they operate (n = 2**).** The responses show involvement in **the automotive industry** and in **mechanical engineering and mechatronics**, both of which are key industrial sectors in Slovenia and heavily intertwined with technological innovation, automation and high-level technical skills.

These sectors are also among the main employers of Higher Vocational College graduates, making their feedback particularly relevant for the alignment of curricula with labour-market needs.

4.2.3. COMPANY SIZE

To contextualise the characteristics of participating companies, respondents were asked to indicate their company size measured by the number of employees (n = 2). The results show a clear contrast between the two responding organisations. One company falls within the **11–50 employees'** category (50%), indicating a smaller, specialised firm, while the other belongs to the **250+ employees'** category (50%), representing a large industrial enterprise.

This distribution, although based on a small sample, captures perspectives from both a medium-sized technology-focused company and a large industrial employer. Such diversity provides a useful basis for understanding how cooperation patterns, competence needs and development priorities may differ depending on organisational scale.

The results are visually presented in Figure 12, which illustrates the size categories of the responding companies.

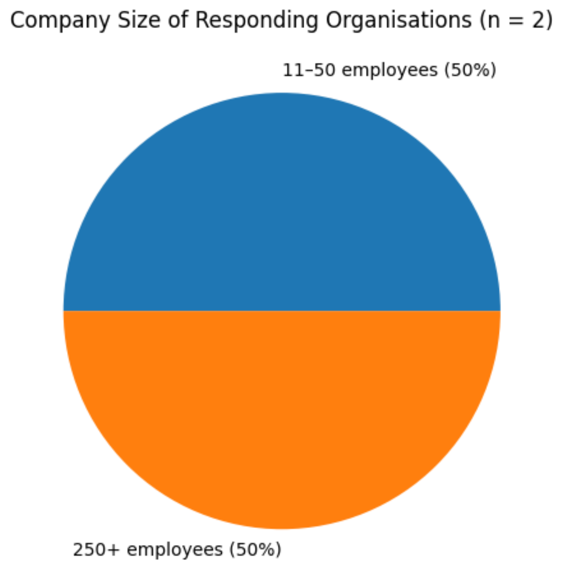

Figure 12: *What is the size of your company?*

4.3. COOPERATION BETWEEN COMPANIES AND HVC

4.3.1. EXISTENCE OF COOPERATION

To determine whether companies maintain collaboration with Higher Vocational Colleges, respondents were asked whether such cooperation is currently in place (**n = 2**). The results show full alignment: **both companies reported active cooperation with Higher Vocational Colleges (100%)**.

Both companies also provided additional comments describing the nature of this cooperation. One company reported working with **a Higher Vocational College located in southeastern Slovenia**, indicating a direct and active partnership with a specific institution. The second company explained that, although it does not currently maintain a list of partner institutions, it considers collaboration to include **school centres that provide Higher Vocational College programmes** and reported previous cooperation with **two such centres in different regions of Slovenia**.

These comments suggest that cooperation is interpreted broadly by companies—ranging from formal, ongoing partnerships with individual Higher Vocational Colleges to more flexible, past or intermittent collaborations with school centres offering Higher Vocational programmes. This diversity reflects different levels of engagement and different organisational needs, influenced by regional proximity and the specific skills required by each company.

The results are visually presented in Figure 13, which illustrates that both responding companies maintain some form of cooperation with Higher Vocational Colleges.

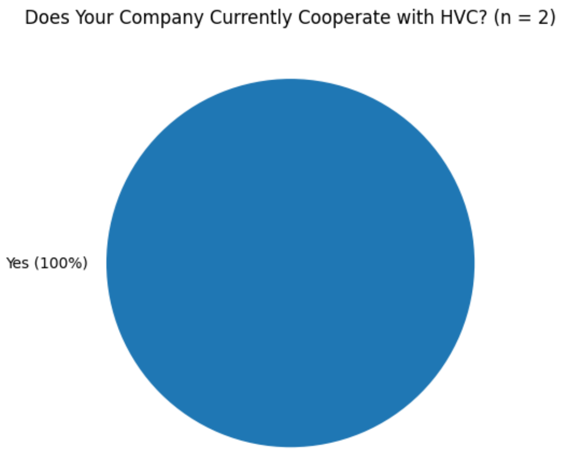

***Figure 13**: Does your company currently cooperate with HVC?*

4.3.2. FORMS OF COOPERATION

To examine how companies collaborate with Higher Vocational Colleges, respondents were asked to indicate the forms of cooperation in which they engage (n = 2, multiple responses allowed). The results show that collaboration is concentrated in practical, operational and resource-related activities.

Both companies (100%) reported providing **work-based learning placements**, confirming that offering practical training opportunities remains the most widespread and essential form of cooperation between companies and Higher Vocational Colleges.

Beyond this common element, the responses diverge. **One company (50%)** indicated cooperation through **support for practical training delivered at the institution (PRI)** and through **providing or lending equipment**, which shows a higher level of engagement by contributing directly to school-based training conditions. This strengthens the technological relevance of institutional training environments. **The other company** selected only **work-based learning**, suggesting a more traditional cooperation model focused exclusively on hosting learners in the workplace, without additional forms of support.

No companies reported participating in advanced cooperation models such as co-teaching, co-design of modules or development of micro-credentials, indicating that collaboration remains primarily operational rather than strategic or curriculum oriented. The distribution of cooperation forms is visually presented in Figure 14**.**

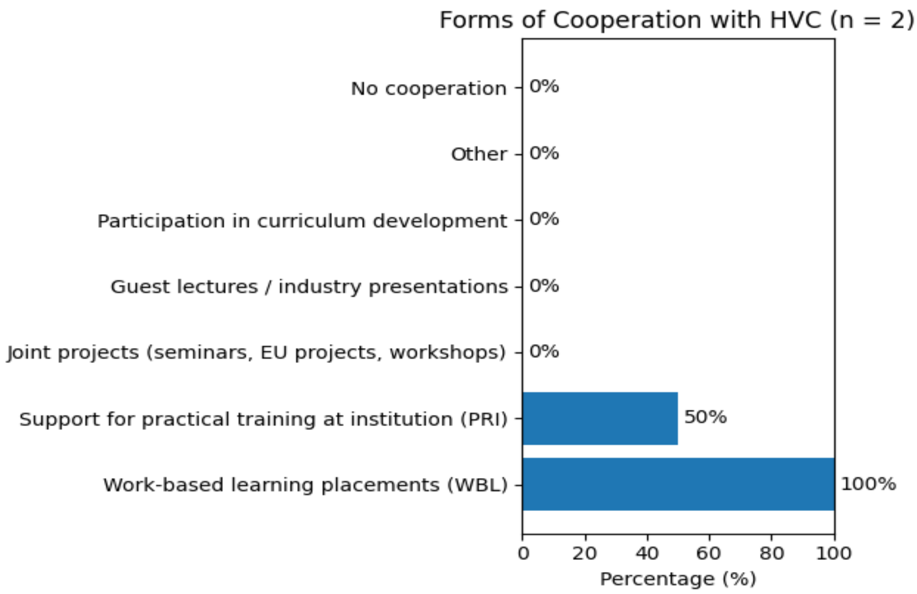

Figure 14: *In what ways does your company cooperate with HVC?)*

4.3.3. FREQUENCY OF COOPERATION

To understand how regularly companies have engaged with Higher Vocational Colleges over the past three years, respondents were asked to indicate the frequency of their cooperation (**n = 2**). The results show that both companies maintained some level of collaboration during this period, but with different levels of intensity. **One company** reported that cooperation took place **every year**, while the **other company** indicated that collaboration occurred **occasionally**, meaning one to two times in the last three years.

This distribution suggests that, although cooperation is present in both cases, it is not yet fully systematic or embedded as a stable, recurring practice across all companies. For one company, collaboration appears to be more structured and regular, whereas for the other it is more ad hoc and likely driven by specific needs or opportunities, such as work-based learning placements or equipment-related support.

The distribution of responses is visually presented in Figure 15 which shows that **50%** of companies cooperated with Higher Vocational Colleges **every year**, and **50%** did so **occasionally**, with no companies reporting an absence of cooperation.

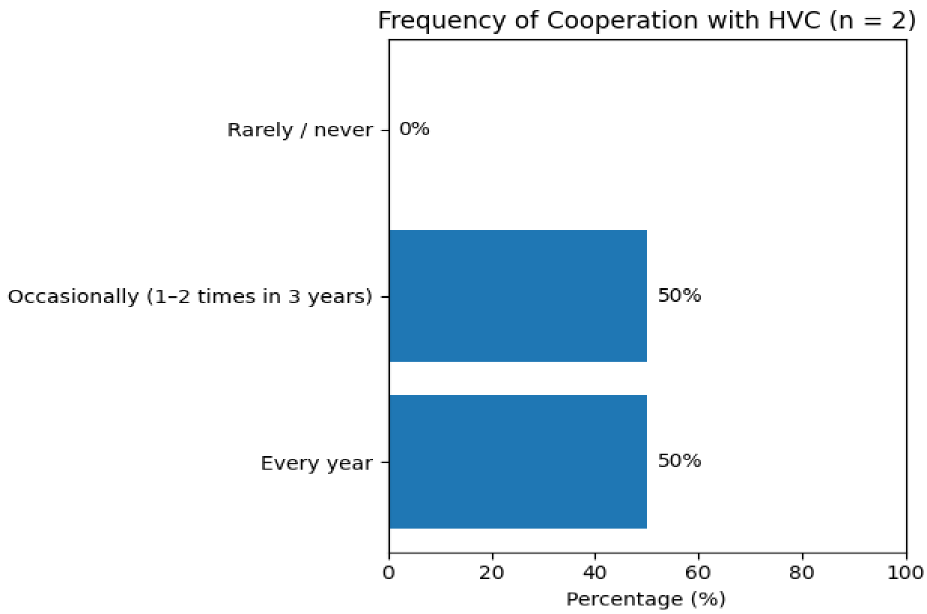

Figure 15: *How frequently has your company cooperated with HVC in the past three years?)*

4.3.4. CHANGES IN COOPERATION

To assess how cooperation between companies and Higher Vocational Colleges has evolved over the past three years, companies were asked whether their level of cooperation had increased, remained stable or decreased (**n = 2**). The results show a clear and consistent trend: **both companies reported that cooperation has decreased (100%)**.

The open comments provide important insight into the reasons behind this decline. One company explained that cooperation decreased because there were **fewer opportunities for practical training placements**, which had previously represented the main form of collaboration. The company also noted that higher vocational colleges had indicated **a lack of financial resources**, limiting their ability to maintain or expand cooperation.

The second company also reported a decrease in cooperation, explaining that the decline was linked to **a reduction in structured opportunities for engagement** and a more limited outreach from schools compared to previous years.

These statements suggest that the decline in collaboration is not caused by a lack of interest from companies, but rather by **institutional, organisational and funding-related constraints on the side of the schools**, which will be further examined in the Discussion chapter. The results are visually presented in Figure 16, which confirms that both companies experienced a reduction in cooperation over the past three years.

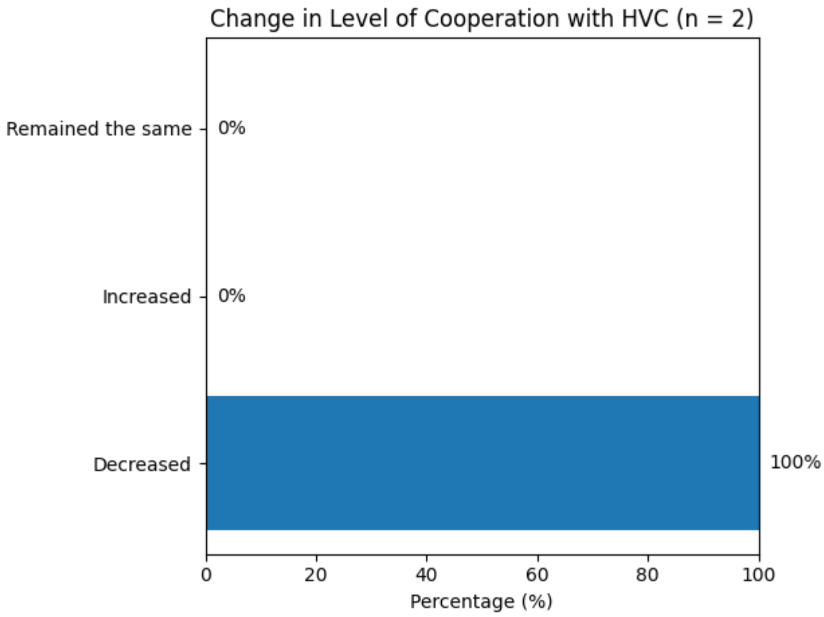

Figure 16: *How has the level of cooperation with HVC changed in the last three years?*

4.3.5. QUALITY OF COOPERATION

To assess how companies perceive the overall quality of their cooperation with Higher Vocational Colleges, respondents were asked to rate their experience on a five-point scale **(**n = 2**)**. The results show a highly positive overall evaluation. Both companies rated the cooperation **as "very good"**, giving the highest possible score**.** No company selected lower satisfaction categories, indicating that both respondents view their cooperation with schools in a clearly positive light.

The open-ended comments further illustrate why companies value this collaboration. One company highlighted that cooperation helps **promote the organisation among learners who may later seek employment in industrial companies**, strengthening company visibility and supporting long-term talent attraction. The same company added that cooperation enables them to **train potential future employees**, as learners gain practical experience directly aligned with the company's needs.

The second company likewise emphasised the **recruitment benefits** of cooperation, explaining that collaboration helps them to **identify potential employees**, since they can observe learners' work performance and fit for the company during practical training.

Collectively, the feedback indicates that companies perceive cooperation with Higher Vocational Colleges as **strategically important**, particularly for workforce development, employer branding and early talent identification. The high satisfaction scores suggest that despite earlier reported decreases in the volume of cooperation, the *quality* of collaboration remains strong. These results are visually presented in Figure 17.

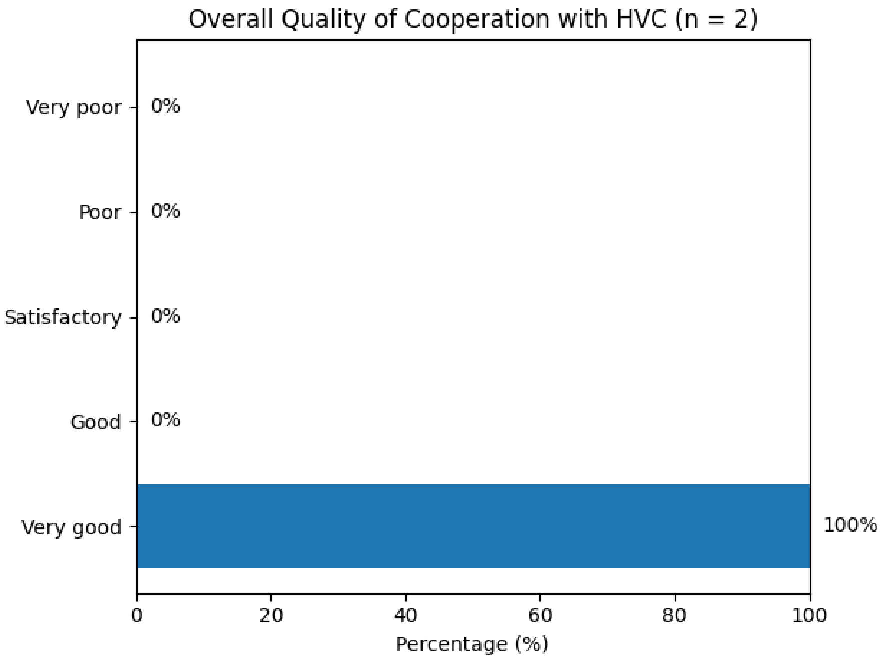

Figure 17: *How would you rate the overall quality of cooperation with HVC?*

4.3.6 BARRIERS TO COOPERATION

To identify the main challenges that companies face when cooperating with Higher Vocational Colleges, respondents were asked to indicate the barriers they encounter when establishing or maintaining collaboration (n = 2, multiple responses allowed). The results show that perceived obstacles differ between companies, reflecting variations in organisational needs and previous cooperation experiences.

According to the quantitative results, **one company (50%)** reported that the main barrier is **insufficient interest from schools**. This suggests that the company experiences difficulties in initiating or maintaining contact and perceives a lack of proactive engagement from Higher Vocational Colleges. Such a barrier may relate to limited staff capacity, organisational priorities or resource constraints within the schools.

The second company did not select any predefined barrier in the closed-ended section but provided an important open-ended comment stating that **there are no barriers** and emphasising that cooperation has been **excellent**, particularly due to the school's **recognition of the company's needs** and the **good relationship with the practical training coordinator (PRI leader)**. This comment indicates that, for this company, cooperation functions smoothly and is well aligned with their expectations.

The contrast between the two responses reveals that barriers are not systemic but **company-specific**, shaped by individual experiences, communication flows and the responsiveness of educational institutions. While one company perceives limited initiative from schools as a constraint, the other highlights highly positive collaboration without any obstacles.

These findings confirm that cooperation success depends on **effective communication, clear expectations and institutional capacity**, aspects that will be explored further in the Discussion chapter. The results are visually illustrated in Figure 18.

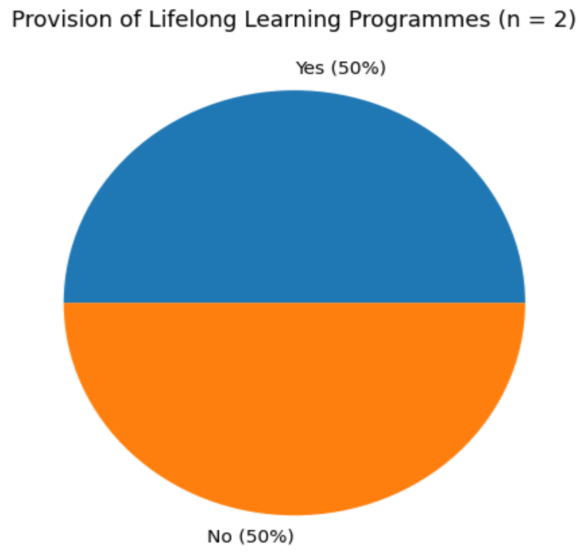

Figure 18: *What obstacles or challenges does your company face in cooperating with HVC?)*

4.4. COMPETENCE NEEDS IDENTIFIED

4.4.1. MOST IMPORTANT COMPETENCES

To explore which competences companies consider most important among graduates, respondents were asked to identify the skills that have proven most relevant for their organisation in the past three years (n = 2, multiple responses allowed). The results indicate that companies prioritise **a combination of technical and transversal competences**:

- **Technical competences** (mechanical, electrical or mechatronic skills)
- **Digital competences** (ICT use, basic programming, digital tools)
- **Communication skills**, which were highlighted by both companies as increasingly crucial

This distribution shows that companies expect graduates not only to possess core vocational and technical knowledge but also to demonstrate strong interpersonal and digital capabilities. The emphasis on communication skills is particularly noteworthy, as it reflects companies' growing need for employees who can interact effectively in teams, solve problems collaboratively and communicate clearly with colleagues, clients and supervisors.
The results are visually presented in Figure 19, which illustrates the prioritised competences selected by both companies.

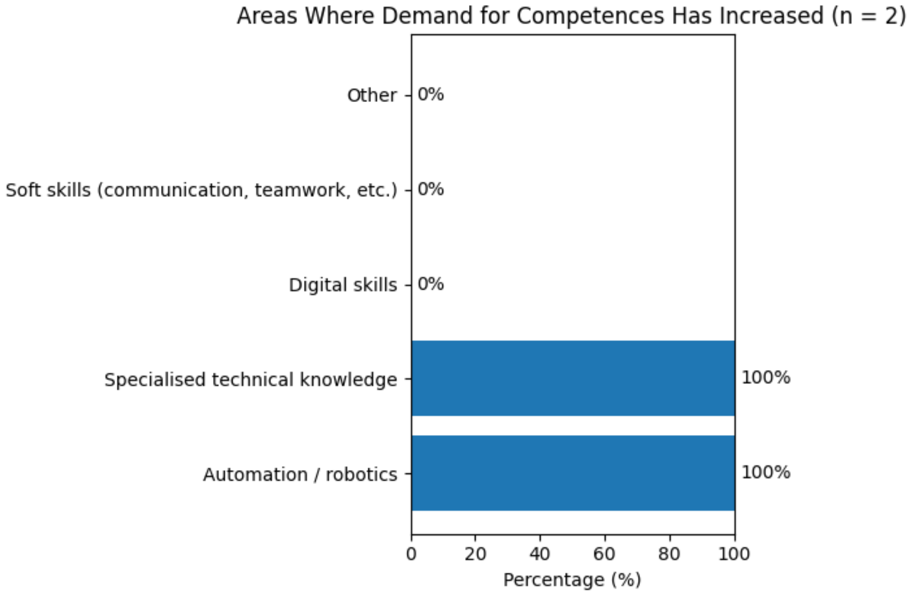

***Figure 19**: Which competences do you expect employees to increasingly need in the future?*

4.4.2. CHANGES IN DEMAND FOR COMPETENCES

To determine whether companies have experienced changes in the competence requirements for graduates over the past three years, respondents were asked whether their expectations regarding new skills had shifted (**n = 2**). The results show mixed experiences: **one company** reported that its competence needs **have changed**, while the **other company** indicated **no change**.

The company reporting changes provided a valuable open-ended comment explaining that today's graduates require **stronger communication skills**, noting that such skills are sometimes **insufficient among younger employees**. This suggests that clear, confident and professional communication has become more important in recent years, particularly in roles requiring teamwork, planning, coordination and client interaction.

This qualitative insight aligns with the findings from the previous question (Q12), where **communication skills were also highlighted as a key competence** by both companies. The alignment of quantitative and qualitative data indicates that companies are increasingly prioritising transversal competences and that communication skills are viewed as an area where improvement is needed.

Overall, the results suggest that while technical and digital skills remain essential, **soft skills—especially communication—are becoming more central** to employer expectations. The results are visually summarised in Figure 20.

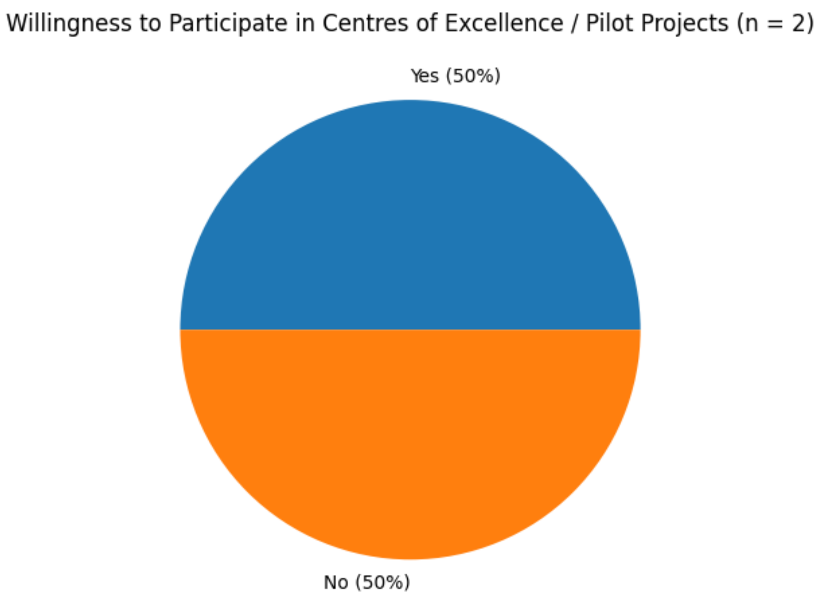

Figure 20: Has the demand for new competences among graduates changed in the past three years?

4.5. DIGITAL AND CURRICULUM-RELATED ENGAGEMENT

4.5.1. INTEGRATION OF INDUSTRY 4.0 CONCEPTS IN TRAINING

To assess the extent to which companies integrate Industry 4.0 concepts into their internal training and education activities, respondents evaluated their level of implementation using a five-point rating scale (1 = very poor, 5 = excellent) (n = 2). The results reveal a noticeable disparity between the two companies. **One company** assigned a rating of **3 (“sufficient”)**, indicating partial but not systematic integration of Industry 4.0 topics. The **other company** selected the highest rating, **5 (“excellent”)**, signalling a strong and comprehensive incorporation of Industry 4.0 elements into its training processes.

This distribution suggests that the adoption of advanced technologies, digitalisation practices and smart-industry concepts varies significantly between companies. While one company appears to have established a well-developed system that supports continuous digital and technological upskilling, the other company is still in the early stages of integrating such content.

Overall, these findings show that the implementation of Industry 4.0–related training is **not yet consistent across companies**, highlighting potential differences in strategic priorities, available resources and organisational readiness for digital transformation. The results are visually presented in Figure 21.

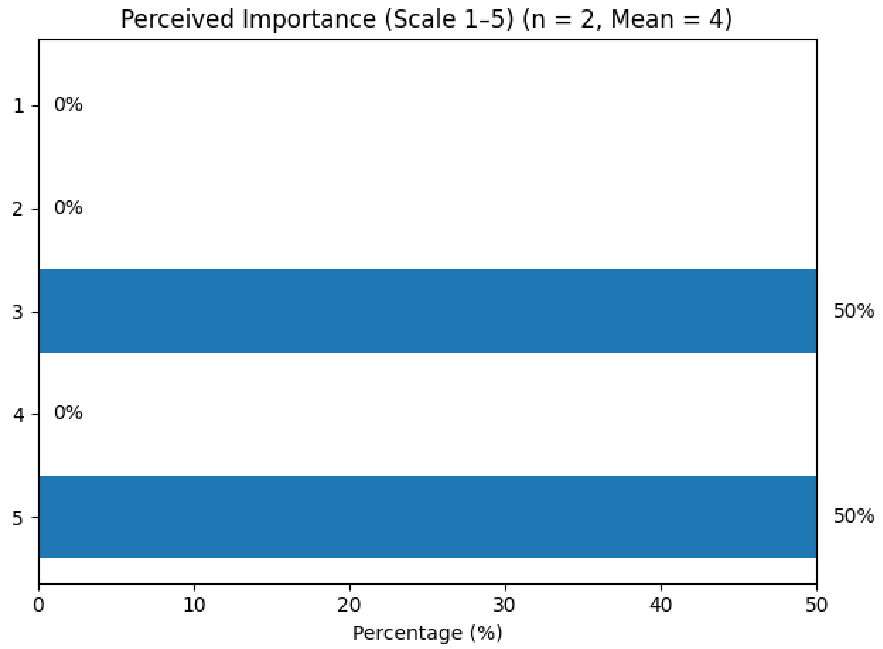

***Figure 21**: How would you assess your company’s integration of Industry 4.0 concepts in training and education?*

4.5.2. PARTICIPATION IN CURRICULUM DEVELOPMENT

To understand how actively companies engage in shaping the curriculum of Higher Vocational Colleges, respondents were asked to indicate their level of involvement in curriculum or module development (**n = 2**). The results show **very limited engagement** overall. **One company (50%)** reported that it **does not participate at all** in curriculum development, while the **other company (50%)** indicated that it participates **to a limited extent**.

These results suggest that although one company has had at least some contact with curriculum-related processes, the involvement remains minimal and not structurally embedded. The absence of substantial participation indicates that curriculum development continues to be largely school driven, with limited opportunities or mechanisms for companies to contribute meaningful input. This limited involvement stands in contrast to earlier results, where companies emphasised the importance of practical training and the need for stronger communication skills—areas where structured industry input could be particularly valuable. The results are visually presented in Figure 22**.**

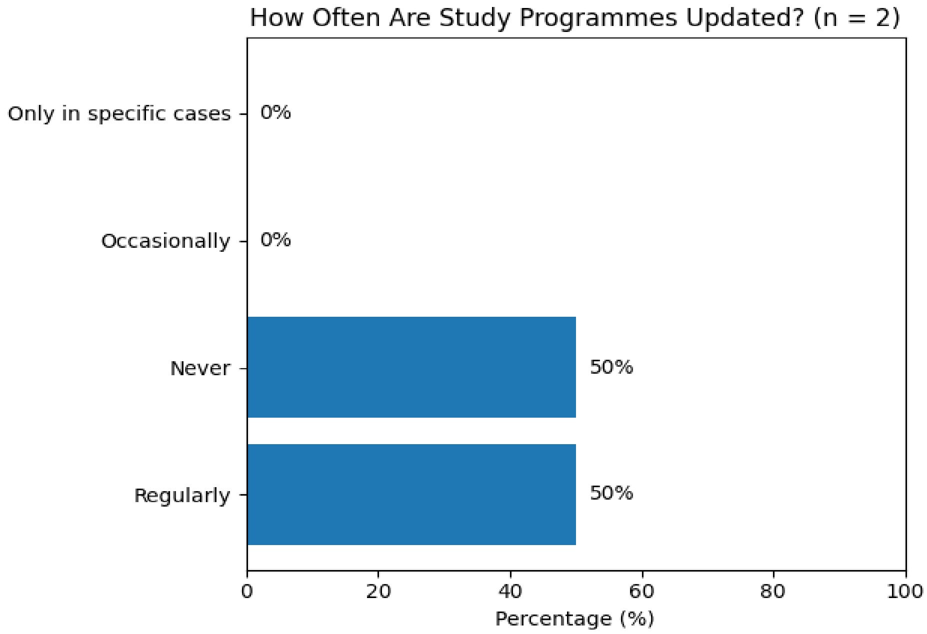

Figure 22: *How actively does your company participate in the development of the school's curricula?*

4.5.3. LIFELONG LEARNING OPPORTUNITIES IN COMPANIES

To assess whether companies provide opportunities for continuous professional development, respondents were asked whether they offer lifelong learning (LLL) programmes for their employees (n = 2**).** The results show a clear division: **one company** reported that it **does offer lifelong learning opportunities**, while the **other company** indicated that such programmes are **not available**.

The company that reported offering LLL opportunities explained that these consist of **internal training programmes**, meaning that upskilling activities are organised within the company rather than through external providers or formal partnerships. This suggests that the company invests in building internal learning capacities and ensures that employees receive job-specific training aligned with company needs.

In contrast, the second company does not provide structured lifelong learning opportunities, indicating the absence of internal training frameworks or external learning pathways for employees. This aligns with wider trends observed in earlier results, where differences between companies appeared in the integration of Industry 4.0 concepts and participation in curriculum-related processes.

Overall, the findings show that lifelong learning provision varies significantly between the two companies, reflecting differences in organisational resources, strategic priorities and approaches to workforce development. The results are visually presented in Figure 23.

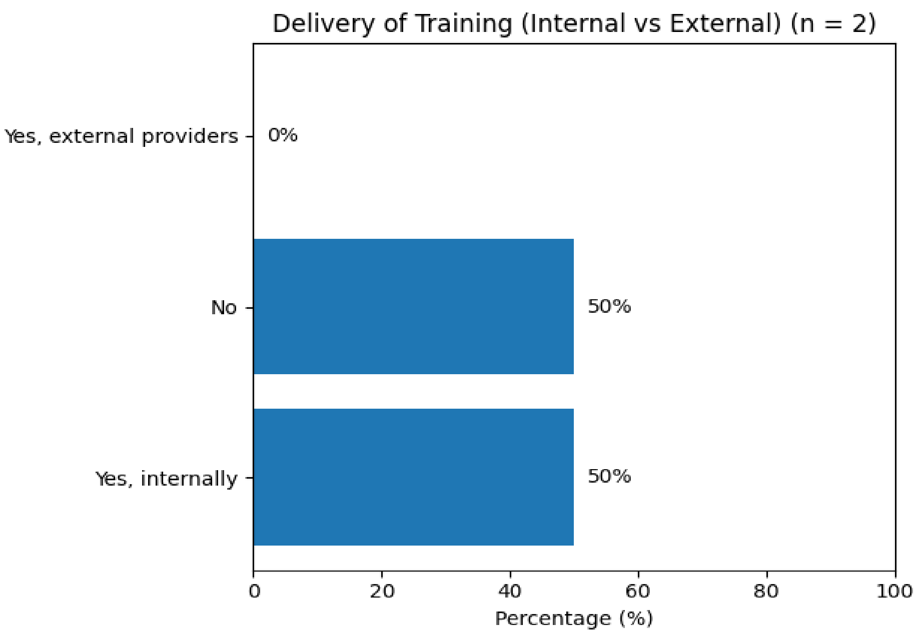

Figure 23: *Does your company offer programmes for further education and training of employees (lifelong learning)?*

4.6. INTERNATIONAL MOBILITY AND FUTURE SKILLS NEEDS

4.6.1. IMPORTANCE OF MOBILITY FOR ACQUIRING NEW KNOWLEDGE

To assess how companies perceive the importance of international mobility for acquiring new knowledge, respondents evaluated the relevance of mobility opportunities—such as study visits, professional exchanges or international training—on a **five-point scale**, where **1 = not important at all** and **5 = very important** (**n = 2**).

The results show complete alignment between the companies: **both companies assigned a score of 3**, indicating that mobility is viewed as **moderately important** for acquiring new knowledge. This suggests that companies recognise potential benefits of mobility—such as exposure to new technologies, innovative practices, and different organisational approaches—yet they may not consider mobility a key strategic priority.

The identical responses also imply that companies see mobility as useful, but its relevance may depend on context, available resources, or the specific objectives of each mobility activity. Mobility is thus perceived as a supportive, but not essential, mechanism for professional development. The distribution of responses is visually presented in Figure 24.

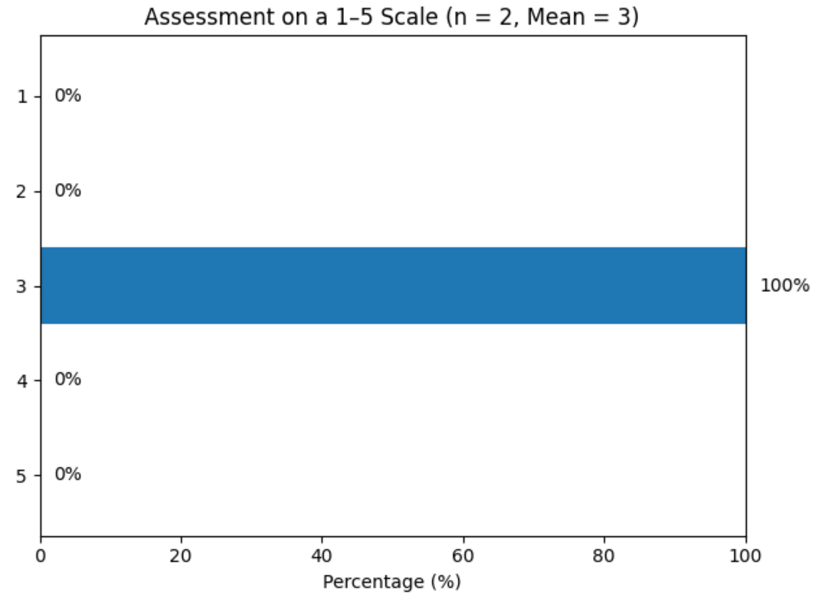

Figure 24: *How important is mobility abroad for acquiring new knowledge*

4.6.2. WILLINGNESS TO PARTICIPATE IN CENTRES OF EXCELLENCE AND PILOT PROJECTS

To explore the potential of companies to engage in more advanced forms of collaboration with Higher Vocational Colleges, respondents were asked whether they would be willing to participate in **centres of excellence** or **pilot projects**—such as learning factories, digital twins or smart logistics initiatives (**n = 2**). The results show a generally positive orientation, though with differing levels of certainty. **One company** responded **"Yes"**, indicating clear interest in taking part in such advanced and practice-oriented development activities. The **second company** selected **"Maybe"**, signalling conditional openness to participation, depending on the specific scope, resource requirements or perceived benefits of the proposed projects.

These responses suggest that companies recognise the potential value of engaging in centres of excellence and pilot activities, particularly in areas linked to digital transformation and applied innovation. However, the hesitation expressed by one company indicates that participation may depend on organisational capacity, available time, or clearer incentives from the collaboration framework. The distribution of responses is visually presented in Figure 25.

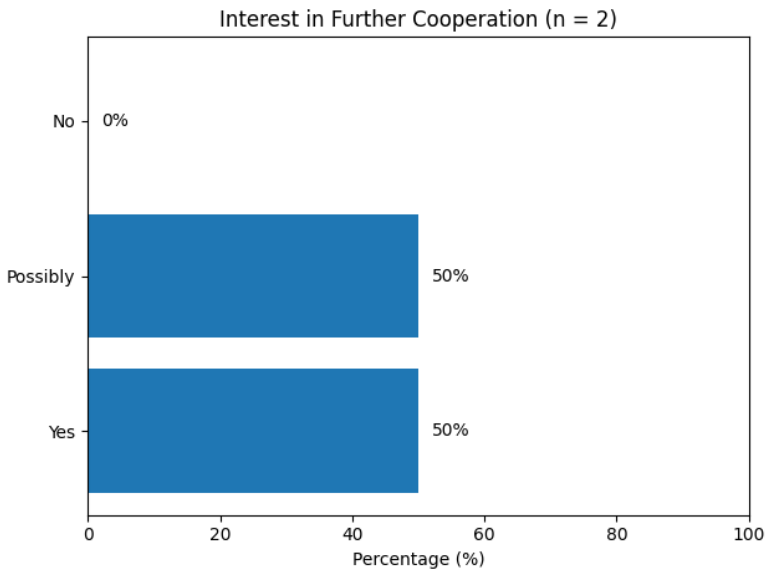

Figure 25: Would your company be willing to participate in Centres of Excellence / pilot projects (e.g., learning factory, digital twin, smart logistics)?

4.6.3. FUTURE SKILLS AND TRAINING INTERESTS

To identify priority areas for future professional development, companies were asked which types of training content would be most relevant and valuable for their employees (n = 2, multiple responses allowed). The results show that both companies express interest in a wide range of training topics, with a clear emphasis on strengthening **digital**, **technical**, and **transversal skills**.

The responses indicate that companies would most welcome training in:

- **Digital technologies and ICT skills**, including programming, digital tools, automation and data-related competences.
- **Technical and engineering topics**, particularly those connected to modern production processes.
- **Leadership and management skills**, reflecting a need to strengthen the ability of employees to coordinate teams, plan work and make decisions.
- **Communication and teamwork**, signalling continued demand for transversal competences that support effective collaboration in technologically advanced environments.

Both companies selected several of these options, showing a broad recognition that future competitiveness requires a balanced combination of advanced technical expertise and strong soft skills. The parallel interest in digital and managerial competences suggests that companies anticipate ongoing changes related to digital transformation, process optimisation and increased autonomy of employees. The distribution of responses is visually presented in Figure 26.

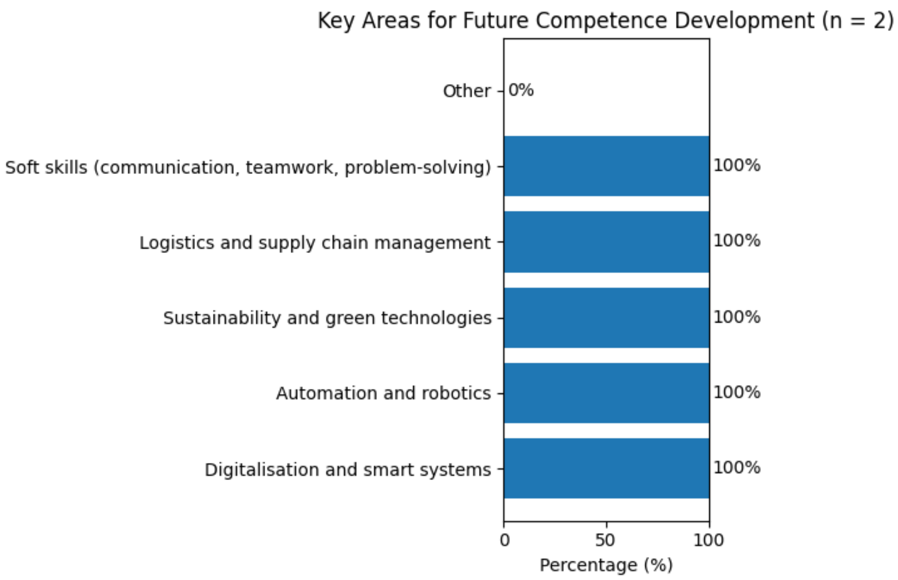

Figure 26: *Which types of training would be most useful for your employees? (select all that apply)*

4.7. AWARENESS AND INTEREST IN THE LCAMP PLATFORM

4.7.1. AWARENESS OF THE LCAMP PLATFORM

To assess the level of familiarity that companies have with the LCAMP – Learner-Centric Advanced Manufacturing Platform**,** respondents were asked whether they already know the platform (n = 2). The results show no awareness among the participating companies**. Both companies** responded **"No"**, indicating that they have not previously encountered or used the LCAMP platform.

This finding suggests that LCAMP has limited visibility among companies in the Slovenian context, despite its role in supporting advanced manufacturing skills, training, mobility and Centres of Vocational Excellence across Europe. The complete lack of awareness highlights the need for stronger outreach, communication and dissemination activities targeting businesses—particularly those engaged in digital transformation or interested in upskilling their workforce. The distribution of responses is presented in Figure 27**.**

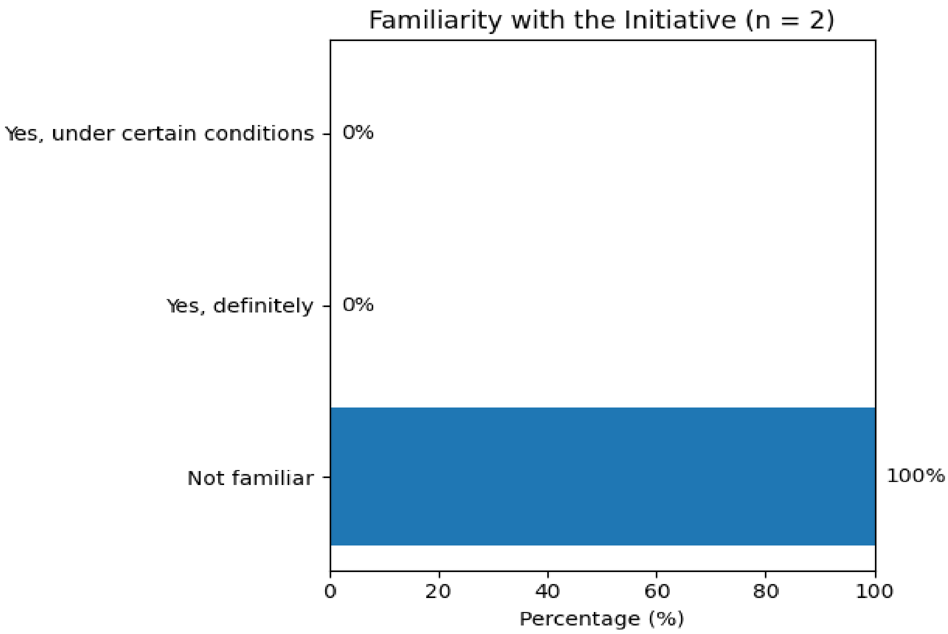

Figure 27: *Are you familiar with the LCAMP platform and its services?*

4.7.2. INTEREST IN PARTICIPATING IN TRAINING VIA THE LCAMP PLATFORM

To explore whether companies would be interested in involving their employees in training programmes delivered through the LCAMP platform, respondents were asked if such programmes would be relevant for their organisation (n = 2**).**

Both companies responded **"Possibly"**, indicating **conditional interest**. This means that neither company rejected the idea of participation; instead, they emphasised that their engagement would depend on whether the **content of the training aligns with their specific needs**. In other words, LCAMP-based training is perceived as potentially useful, but companies would require a clear match between the offered programmes and their current skill gaps, technological focus and strategic priorities.

This cautious but positive stance is consistent with the previous finding that neither company is yet familiar with the LCAMP platform. Although awareness is currently absent, both companies remain open to future collaboration, provided that the training offer is **practical, relevant and tailored to their context**. The distribution of responses is visually presented in Figure 28.

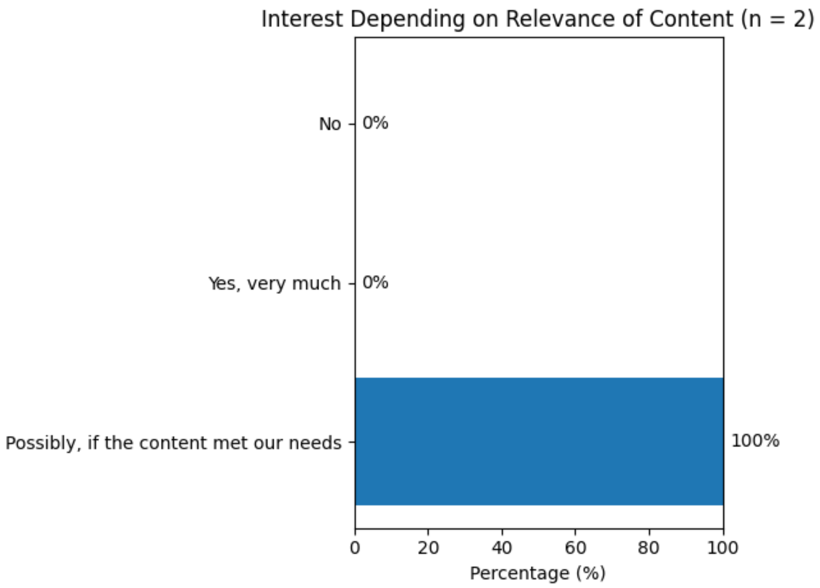

Figure 28: *Would it be interesting for your company to include employees in training offered through the LCAMP platform?*

5. DISCUSSION

5.1. SYNTHESIS OF FINDINGS FROM HVC AND COMPANIES

The results of both surveys reveal a generally aligned understanding of the technological, organisational and competence-related changes affecting the advanced manufacturing sector in Slovenia, while also highlighting structural differences in how higher vocational colleges and companies experience and respond to these developments. Colleges report steady progress in adapting programmes to the digital and green transition, with most institutions indicating that new content—such as IoT, automation, data analytics and sustainability—is increasingly incorporated into curricula. This is accompanied by a clear recognition of the rising importance of hybrid competences that combine technical, digital and green domains. Companies confirm these trends from the labour-market perspective, noting an increasing need for employees who can work with modern digital tools, interpreting data and applying principles of sustainable production. At the same time, companies also emphasise that transversal competences, such as communication and leadership, are becoming equally important in technologically complex environments.

Despite these shared priorities, the two groups differ significantly in their perceptions of cooperation, readiness and system capacity. Colleges generally describe cooperation with companies as stable and in some cases improving, whereas both companies explicitly report that collaboration has **decreased** in the past three years. Their qualitative comments attribute this decline to time constraints, staffing shortages and organisational pressures, noting that schools often approach them at times when companies “do not have enough staff to engage.” One company stated that collaboration is highly dependent on specific individuals and internal workloads, while the other reported that cooperation had been stronger in the past when more resources were available. On the school side, comments similarly point to internal limitations—particularly the lack of teachers with sufficient expertise in advanced technologies and the need for additional staff to meaningfully integrate Industry 4.0 concepts into teaching. Some institutions explicitly noted that “additional personnel would be needed to carry out these activities,” especially in the context of new approaches such as micro-credentials, modular programmes or expanded cooperation formats.

Awareness and use of LCAMP services provide another point of divergence. Several colleges reported some degree of engagement with the LCAMP platform, Observatory tools or development activities, while **neither of the two companies had heard of LCAMP**. This asymmetry suggests that LCAMP activities were more deeply integrated into the educational sector than into industry, resulting in lower visibility and limited uptake among companies. However, both companies expressed **conditional interest** in LCAMP-based training, indicating they would consider participation if the content matched their needs. Their comments reinforce this: companies would be willing to collaborate on programme development or pilot activities “if the thematic focus fits the organisation and brings clear added value," although current staffing constraints were repeatedly mentioned as a barrier.

When comparing the readiness of colleges and companies for advanced technology integration, colleges perceive gradual improvement in staff preparedness, yet comments reveal that the pace is slow and uneven across institutions. Teachers require additional training, especially in IoT, artificial intelligence and data analytics. Companies, on the other hand, evaluate readiness primarily from the perspective of employees rather than educators, and highlight operational challenges such as limited time for training, prioritisation of production tasks and the need for very targeted, short learning formats. Both groups stress that practical, context-specific training models—such as learning factories, applied workshops and short modular courses—would strengthen relevance and impact.

Finally, the qualitative comments across both surveys converge on one key insight: while ambition and awareness of technological change are high, **systemic and organisational constraints limit the full realisation of collaboration and innovation**. Schools emphasise the need for additional human resources and clearer regulatory frameworks, while companies stress limited capacity, fluctuating workloads and the need for tailored training solutions. These findings underline the importance of strengthening LCAMP's outreach to industry, enhancing flexibility in training formats, supporting teacher upskilling and creating mechanisms that reduce administrative burdens for both sides. In sum, the two surveys together paint a coherent picture: Slovenia's higher vocational sector and its industrial partners share similar strategic priorities but operate under different realities that shape their readiness and ability to fully engage in advanced manufacturing transformation.

5.2 COMPARATIVE SYNTHESIS WITH SLOVENIAN LCAMP OBSERVATORY FINDINGS

A comparative synthesis of the end-of-project survey results and earlier Slovenian LCAMP Observatory outputs — including the national sections of the D3.2 Synthesis Report, the SCM Slovenia Report, and the Predictive Maintenance (PdM) analysis — reveals a coherent and continuous pattern of findings across the entire project cycle. The new surveys largely confirm the trends that emerged throughout LCAMP's systematic monitoring of the Slovenian advanced manufacturing ecosystem. Earlier Observatory reports consistently emphasised several structural characteristics of the Slovenian context: persistent shortages of qualified technical staff, limited capacity for integrating emerging technologies, and an urgent need to develop hybrid competence profiles that bridge technical, digital, and green areas. The surveys conducted at the end of the project reaffirm these insights. Higher vocational colleges report that teachers still require substantial upskilling in IoT, data analytics, and artificial intelligence, while companies observe that employees are not yet adequately prepared for Industry 4.0 tasks — a finding fully aligned with the Slovenian PdM report, which identified gaps in sensor technologies, data-driven maintenance, and analytical competences.

This synthesis also highlights a strong continuity in challenges related to school–industry cooperation. The SCM Slovenia Report identified several barriers that limit the depth and regularity of collaboration, such as time constraints, fluctuating company engagement, and the absence of long-term structured mechanisms for partnership. The end-of-project survey results echo this dynamic: although colleges describe cooperation as stable or gradually improving, both participating companies report a decline in collaboration over the past three years. Their qualitative comments cite operational workload, staffing shortages, and production pressures as key reasons for reduced involvement — precisely the limitations previously documented in the national SCM analysis. On the other hand, colleges emphasise that their own staffing levels constrain their ability to implement new technologies or expand cooperation formats, which corresponds with the Slovenian D3.2 finding that short-cycle higher vocational institutions operate with limited human resources, especially in fields requiring advanced industrial expertise.

Despite these constraints, the surveys confirm that competence needs in Slovenia are evolving in exactly the directions anticipated by earlier Observatory findings. Across all national LCAMP reports, hybrid profiles and the integration of digital and green competences were identified as strategic priorities for Slovenia. The current survey results reinforce this: colleges increasingly integrate green and digital content into curricula, while companies report rising demand for graduates with skills in data interpretation, automation, predictive maintenance, and sustainable production. This alignment demonstrates that both education and industry in Slovenia are recognising and responding to the same transformation pressures observed throughout LCAMP's analytical work.

A notable divergence where the surveys add nuance concerns the visibility and uptake of LCAMP tools. While several colleges report having used or explored LCAMP services, neither of the two surveyed companies was familiar with the platform. This finding corresponds directly to the Slovenian contribution in the D3.2 Synthesis Report, which noted that industry engagement in such European initiatives remains comparatively low and requires targeted outreach and tailored communication strategies. The conditional interest expressed by companies — dependent on the relevance and specificity of the content — reinforces the need for customised, context-sensitive offerings to support meaningful industry participation.

An additional point where the comparative synthesis highlights divergence from other LCAMP partner countries concerns micro-credentials. Earlier Slovenian Observatory contributions noted that, unlike many European partners where micro-credentials are already embedded in tertiary systems (including at EQF level 5), Slovenia remains in a transitional phase. The newly adopted Higher Education Act (ZViS-1) introduces micro-credentials into higher education, yet the short-cycle higher vocational sector has not been formally included, with legislative updates still in preparation. The surveys reflect this transitional state: colleges recognise the potential of micro-credentials but highlight staffing constraints and limited capacity to develop new modular formats, while companies express only conditional willingness to engage. This confirms the structural gap identified in earlier Slovenian LCAMP analyses: Slovenia is strategically aligned with European developments but has not yet established the full regulatory framework required for implementation in higher vocational education.

Taken together, this comparative synthesis demonstrates that the end-of-project surveys reinforce — and in some cases sharpen — the key findings of previous Slovenian LCAMP Observatory reports. The strategic direction has remained consistent over time: digitalisation, sustainability, and hybrid competences are clearly recognised priorities, while structural staffing constraints and limited cooperation capacity continue to hinder full implementation. By linking current survey insights with earlier analytical evidence, it becomes clear that Slovenia's progress in advanced manufacturing transformation is real but uneven, shaped by systemic limitations that must be addressed to fully realise the opportunities highlighted throughout the LCAMP project.

6. CONCLUSION

The end-of-project surveys confirm the key trends previously identified in Slovenian LCAMP Observatory reports: growing demand for hybrid competences, increasing integration of digital and green content in higher vocational education and persistent structural constraints that limit cooperation between education and industry. Higher vocational colleges report steady progress in updating programmes with digital and sustainable topics, while companies confirm rising expectations for graduates who can work across technical, digital and green domains.

Despite this alignment, both sectors face significant staffing and capacity limitations. Colleges lack teachers with advanced technological expertise, and companies report limited time and personnel for cooperation or training—issues consistently highlighted in earlier Slovenian SCM and PdM analyses. A discrepancy also emerges in the perception of cooperation: colleges perceive collaboration as stable, whereas companies report a noticeable decline in the past three years due to operational pressures.

Awareness of LCAMP remains uneven: colleges show partial engagement with the platform, while companies are unfamiliar with it, indicating a need for stronger outreach. The situation regarding micro-credentials further illustrates Slovenia's transitional position. While other LCAMP partner countries already apply micro-credentials at EQF level 5, Slovenia is still developing the legislative framework. Colleges recognise their potential but face resource constraints, and companies express only conditional interest.

Overall, Slovenia shows clear strategic alignment with European trends in advanced manufacturing, yet full implementation remains limited by human-resource constraints, uneven cooperation capacity and an evolving regulatory environment. Strengthening staff development, deepening industry engagement and finalising the micro-credential framework will be crucial for further progress.

7. RECOMMENDATIONS FOR SLOVENIA

- **Strengthen national support for staff upskilling** in digital and green technologies (IoT, AI, data analytics, predictive maintenance, sustainable production), including funding for professional development and partnerships with industry experts.
- **Develop short, flexible and industry-responsive training formats**, such as micro-modules, learning factory workshops and applied demonstrations, to accommodate companies' limited time and staffing capacities.
- **Create structured and predictable cooperation mechanisms** between Higher Vocational Colleges and companies, including joint planning cycles, coordinated communication channels and simplified administrative procedures.
- **Increase LCAMP visibility among companies** through targeted outreach, industry-focused events and tailored communication that highlights concrete benefits and practical use cases.
- **Prepare implementation frameworks for micro-credentials** in short-cycle higher vocational education ahead of legislative changes, including templates, pilot modules and co-design processes involving companies.
- **Enhance human-resource capacity within Higher Vocational Colleges** by supporting recruitment of specialists, enabling industry–teacher exchanges, and creating incentives for technological expertise.
- **Use LCAMP Observatory data systematically** to guide decisions on curriculum development, staff training, regional partnerships and future project planning, ensuring evidence-based policy and institutional development.

8. TABLE OF FIGURES

LCAMP

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