Building Skills 4.0 through University and Enterprise Collaboration

SHYFTE 4.0

WP4: WP Dissemination & Exploitation

D4.6: Network centres and observatory exploitation

vs:2.0.0

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This document describes what the network of Learning Centers of excellence and the Industry 4.0 observatory will be for the project partner's regions. It also defines the system that will support the creation of patents and spin-offs in these 4.0 competence network centers.

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Further Information

http://www.shyfte.eu/

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Project Partners:

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Università degli Studi del Sannio

UNIVERSIDADE NOVA DE LISBOA
OMNIS CIVITAS CONTRA SE DIVISA NON STABIT

COGNITUS
The builder of next generation experts

ATTANAM DAMAYANTI PANDITA
CHIANG MAI UNIVERSITY 1964

KASETSART UNIVERSITY
1943

CHENGDU UNIVERSITY
1978

CUIT
Chengdu University of Information Technology

UPM
UNIVERSITI PUTRA MALAYSIA

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

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1. Executive Summary

Within the framework of the project, a Skills 4.0 Learning Center is developed in each partner country. The objective of this deliverable is to design and create what will be the network of centers of excellence and the Industry 4.0 observatory for each of the partner's region. It describes also the system that support the creation of patents and spin-offs in such Skills 4.0 network centers.

To sustain the Learning Centers, one of the objectives is to create a network of Industry 4.0 learning centers by connecting them through a central site corresponding to the outputs of the Erasmus+ Shyfte 4.0 project

Another objective is to use the Skills 4.0 Learning Centers as an observatory for technology transfer for the companies, to promote innovation, patents, spin-off… Using the design and the functionalities of the observatory: Technology transfer contact form, evaluation and comments of the companies after the training programs, KPI's… to identify the companies technology transfer and innovation.

2. Shyfte 4.0 Learning Centers

Within the project we developed 4 learning centers, one for each domain:

. Domain 1: Industrial engineering and management

. Domain 2: Software engineering and Bigdata analytics

. Domain 3: Wireless networks analytics

. Domain 4: Artificial Intelligence

These Learning centers allow the students and the salaries from the companies to re-skill or up-skill, based on the knowledge related to Industry 4.0.

2.1   Shyfte Learning Centers Architecture

The Learning Centers of Excellence developed for the partner country universities are designed based on the following architecture:
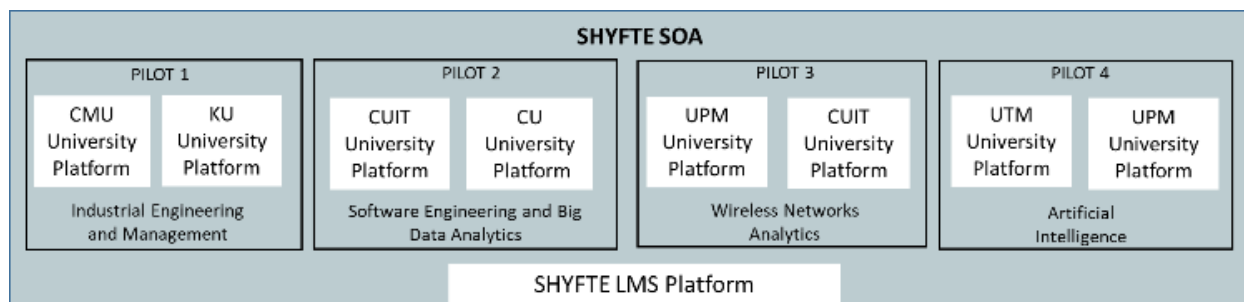
Figure 1. Shyfte Service Oriented Architecture

Shyfte SOA might be implemented through the use of the main LMS platform represented by the Shyfte Centres of Excellence. Federation is known to allow the integration of different components in a flexible way that allows to integrate or combine existing teaching-learning materials from universities with those developed specifically for the Centres of Excellence. Additionally, it is a step forward to allow the life continuity of the Centres, which may be located in Lisbon and replicable in France, and to ensure the maintenance of the Shyfte platform.

The main objective was to develop a Service Oriented Application with different layers (see Figure 2.):

![SHYFTE 4.0 logo]

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- Presentation Layer: the four portals defined for the partners: one for CMU/KU (domain 1), one for CDU/CUIT (domain 2), one for UPM (domain 3) and one for UTM (domain 4)

- Business Processes Layer: services provided for the registration, the training administration and the training enrolment services

- Application Layer: the courses, the student's registration, the quality assessment…

- Resource Layer: LMS, MOOC, Social media platform, Payment platform…

- Data Layer: Database, external cloud data, learning analytic data…

The description of the Learning Center architecture is detailed in the deliverable D2.5
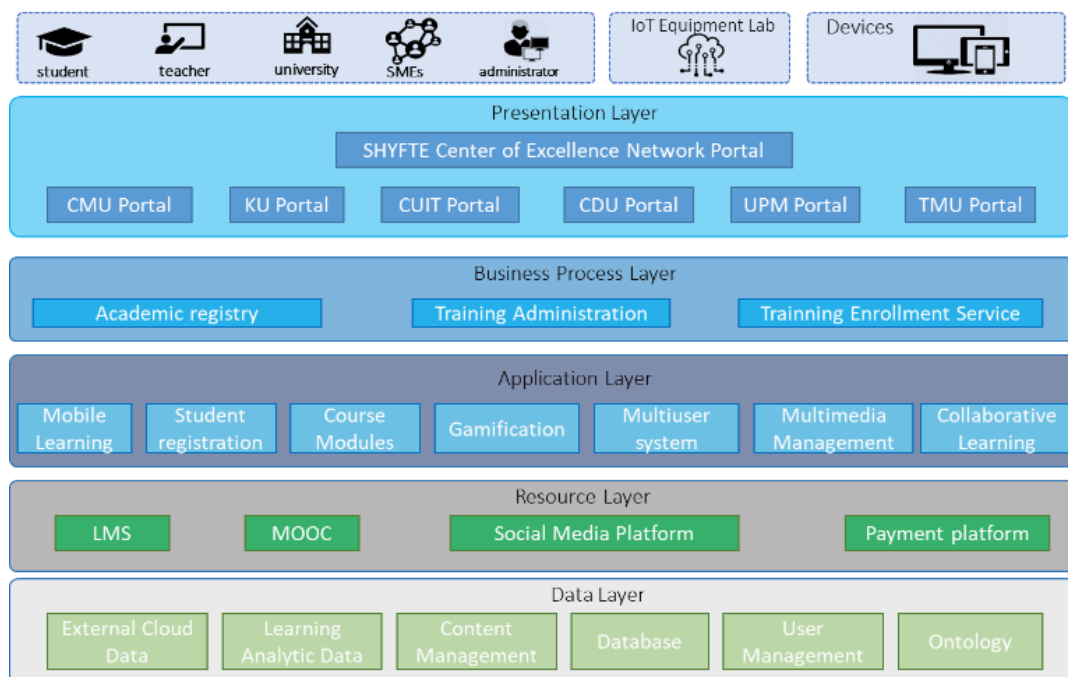
Figure 2. Learning Center Architecture

Each Pilot is responsible for the platform at his or her level, maintaining its identity aligned with country regulations country, thanks to the federation quality of the architecture. The databases are distributed at different locations. This means that there are local databases and databases at the top level of the architecture that should be synchronized.

2.2 Shyfte Learning Centers Description

The description of the Learning Center is detailed in the deliverable D2.6
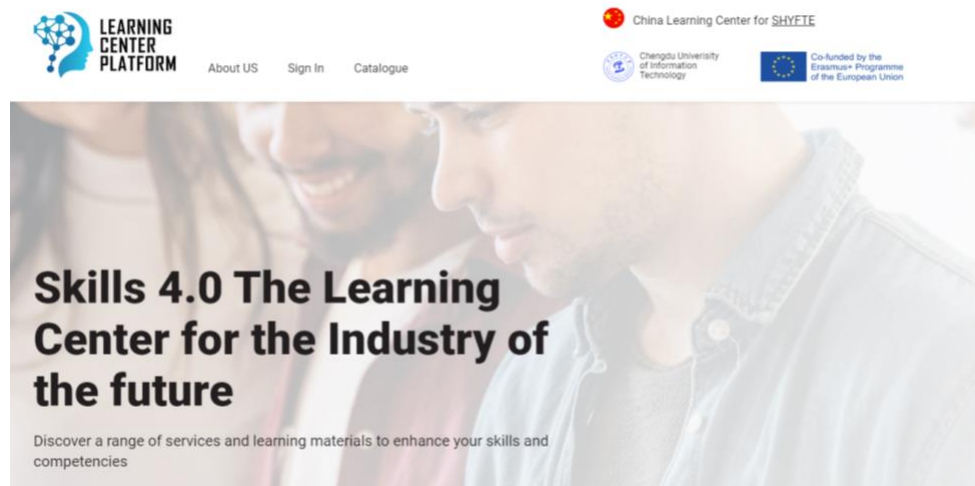

Figure 3. Main page of the Learning Center

The main functionalities and services can be summarized based on the main processes defined in the system:
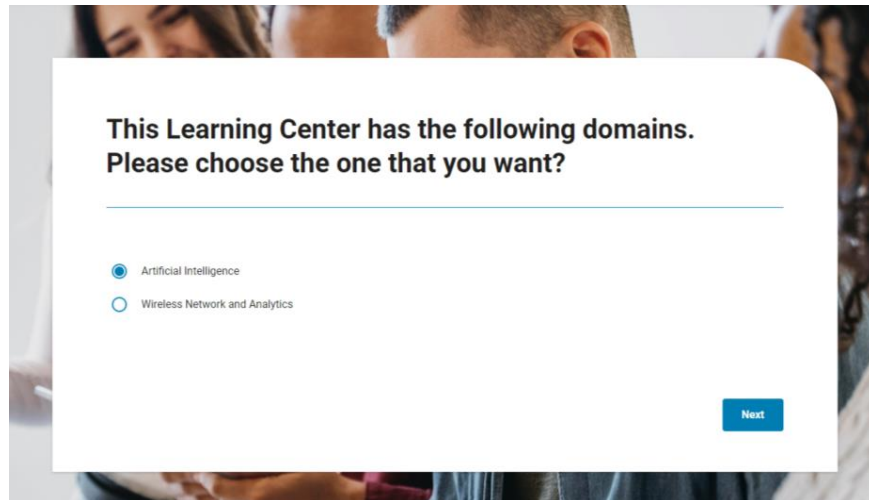
- Student's and Companies registration
- Student's maturity assessment
- Student's individualized training
- Companies' individualized training
- Training assessment
- Technology Transfer & innovation
- …

As example, the student's individualized process follows the main steps one the Learning Center platform:

2.3 Students Individualized Training

The first option will let the users create a training program for themselves depending on what the users want to upskill. The first step is to choose a domain.

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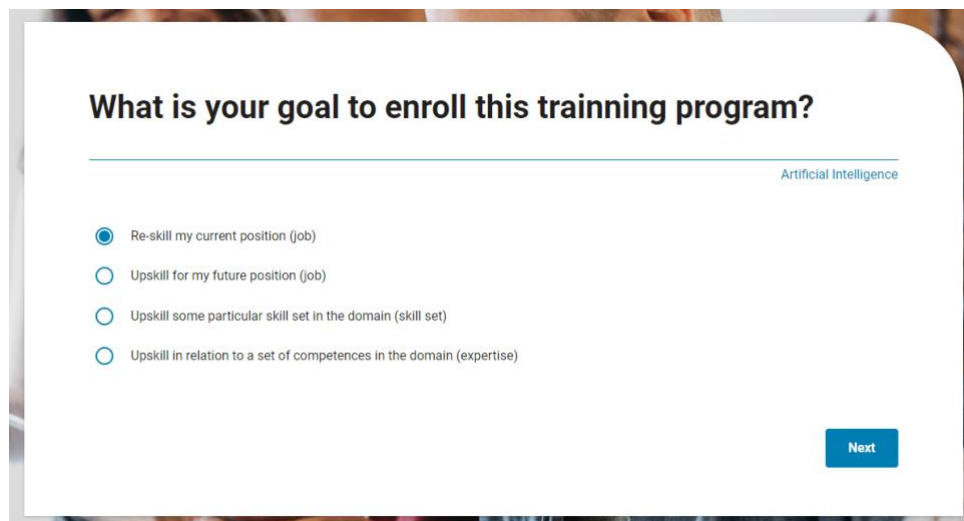
Figure 4. Choosing a domain.

After choosing a domain the users have to choose their goal and there are four options, re-skill or up-skill a job position, up-skill a particular skill set or up-skill a particular competence.
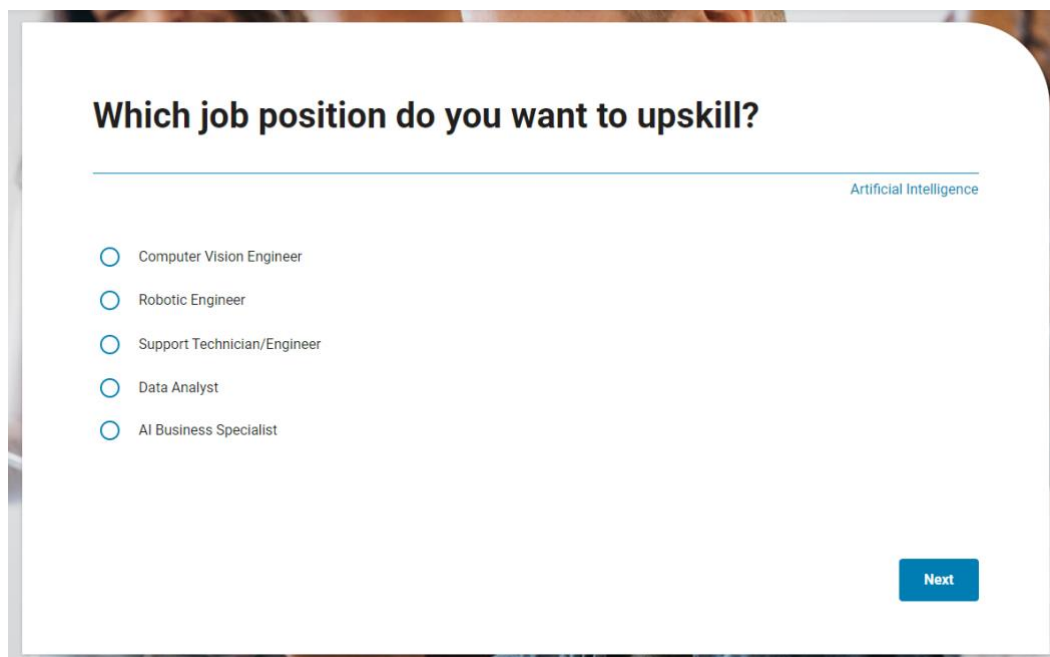
Figure 5. Choosing a goal.

Each option will give the users a list of different possibilities to choose from and those are respectively shown in the next three images (the first two will show the same jobs).

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Figure 6. Choosing a job.

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Figure 7. Choosing a skill set.

The platform will then present to the user a list of hard skills organized by level (Beginner, Intermediate, or Expert) and the users may choose which ones they already know. It is not required to check any skill if a user don't know any of them.

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Figure 8. Choosing a competence to be upskilled.

Now the users must prove that they know the hard skills selected and for that the website will present a quiz with questions regarding those hard skills. If a user didn't know any of the presented skills this part will be skipped.

Figure 9. Questionnaire related to the chosen hard skills.

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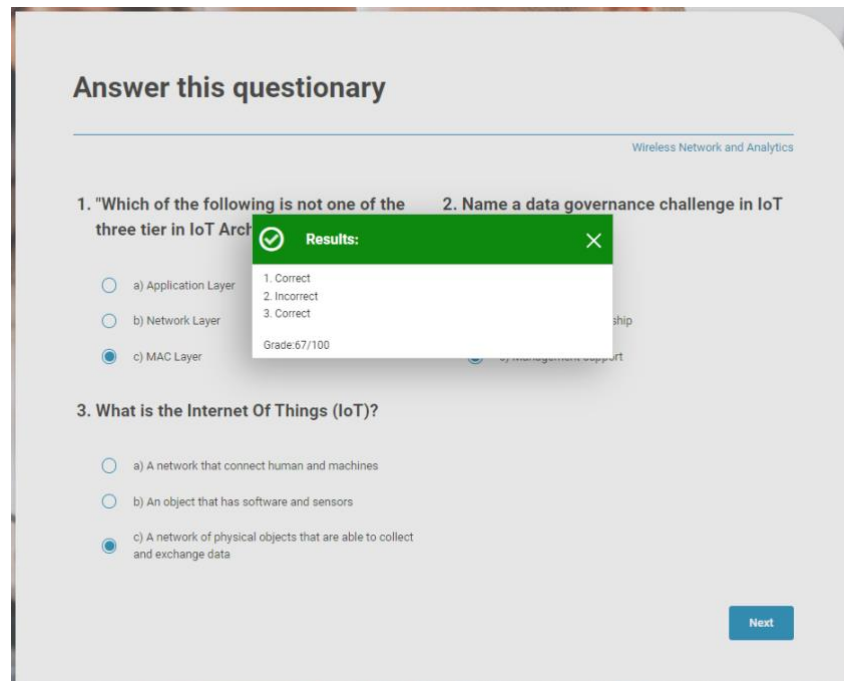Co-funded by the
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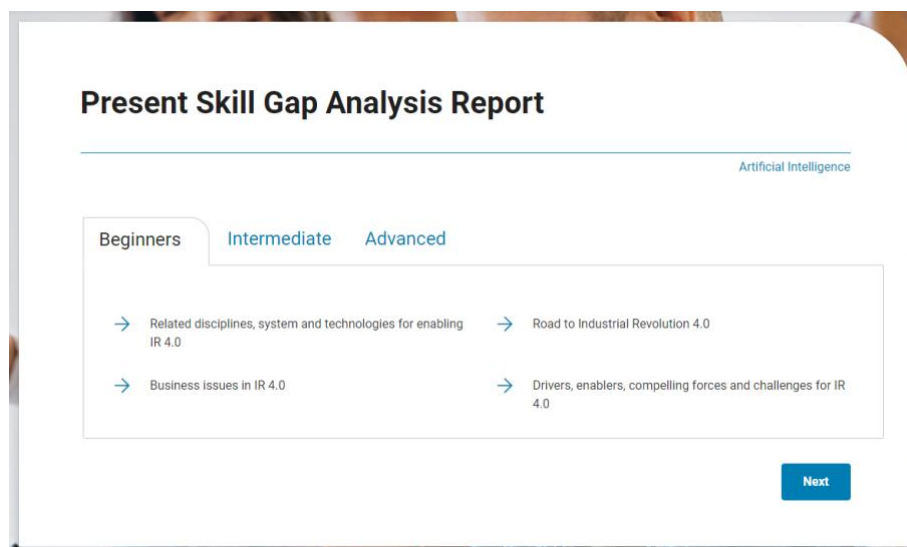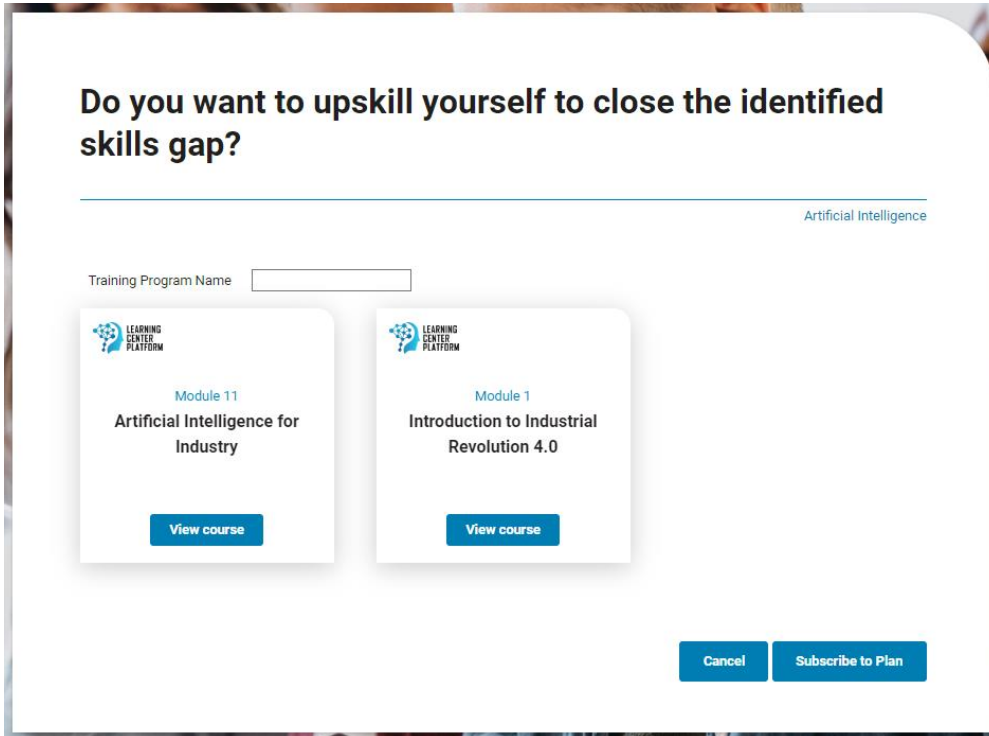Figure 10. The results of the answered questionnaire.

Figure 11. Updating and presenting the initial list of skills *(eg. Beginners Level)*

This way the website defines the skill gap and generates a training program proposal.

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Figure 12. Making decision about upskilling by choosing "cancel" or "subscribing to the plan"

To finalize the process, the user can subscribe or cancel the plan. If the users want to subscribe, they must fill the training program name input, and validate their choice.

For the companies the process is much the same:

2.4 Enterprises Individualized Training

Now going through the process of creating a program for an organization (Enterprises Individualized Training) a user can choose a gap to up-skill or create a custom training program. Reminding that a user can only use this option if the account was created as an organization.

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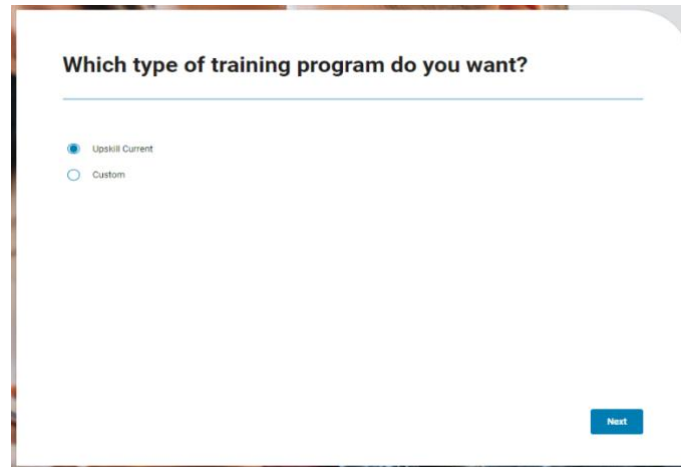
Figure 13. Choosing up-skill or creating a custom training program.

Any of the two options will ask the users to choose a domain.
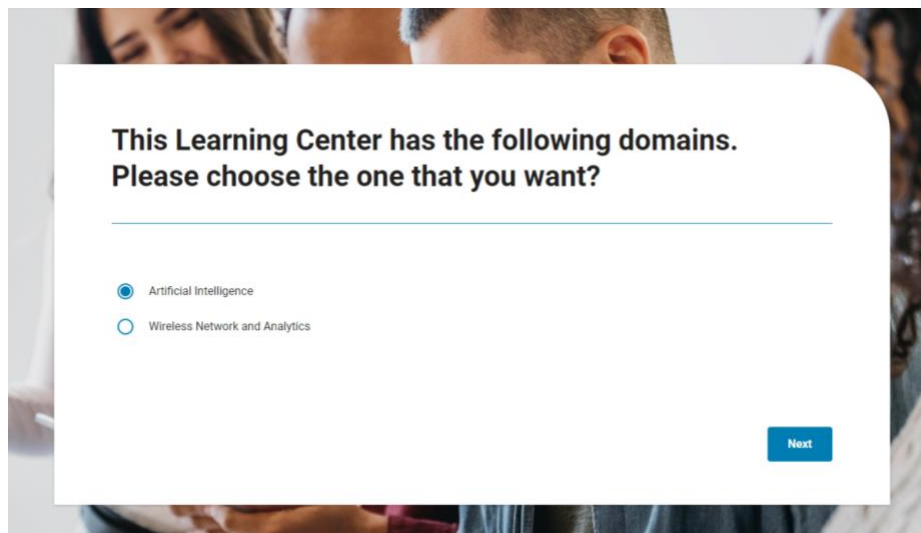
Figure 14. Choosing a domain.

After choosing a domain the system will show a list of concepts in which the users can up-skill the organization.

Figure 15. Choosing the list of concepts.

The next step is to define the skill gap by selecting the current level and the desired one by the organization in relation to the chosen concept.

Figure 16 – Choosing the current level.

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Figure 17 – Choosing the target level.

Based on the defined skill gap the system will generate a training program for the organization.

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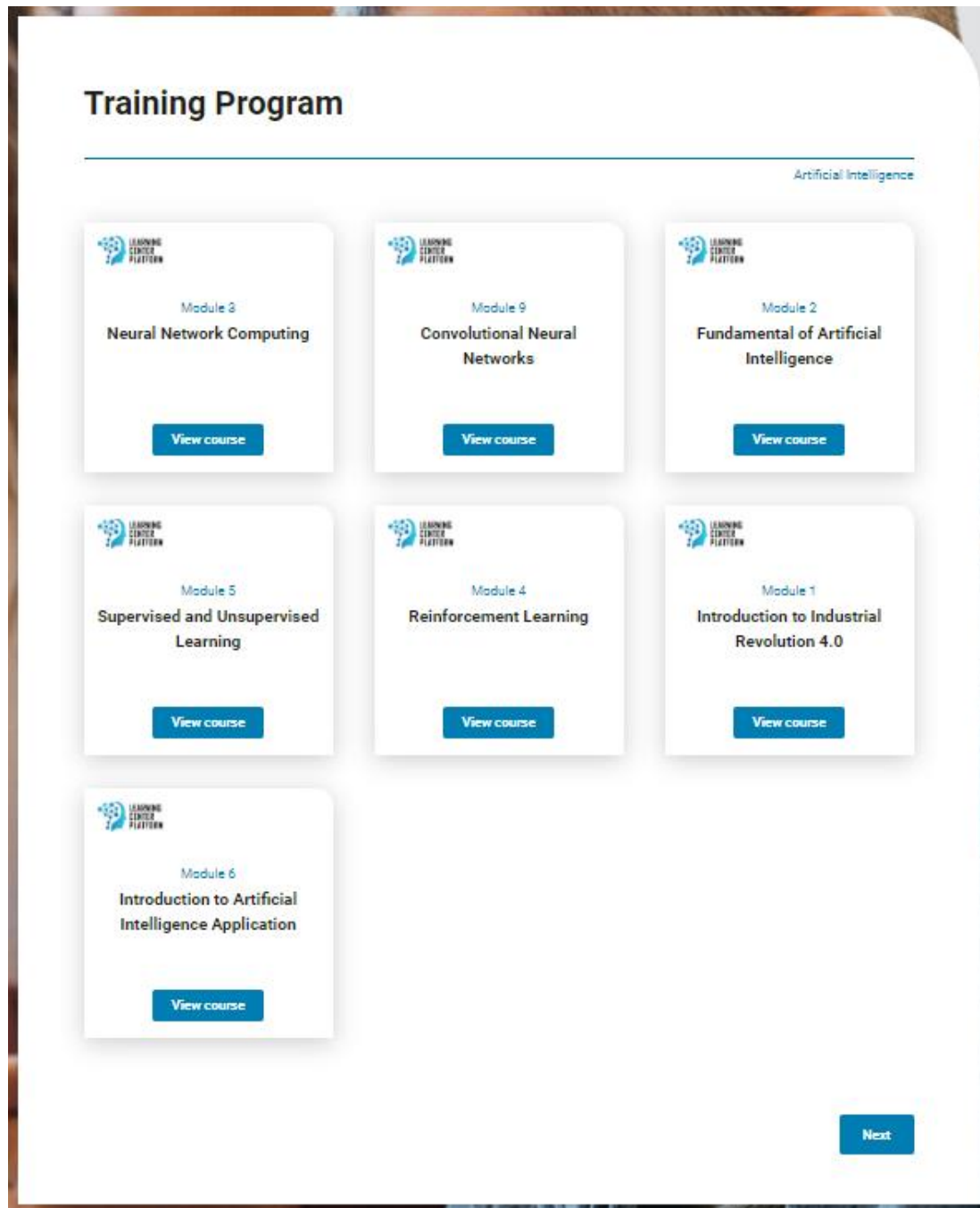
Figure 18 - Training program.

As an organization the users can have multiple people associated to participate in the training program generated, can assign it to themselves or even associate to people that don't have an account already by entering their corresponding email address.

3. The Industry 4.0 Observatory

In SHYFTE was developed a case study to demonstrate the development of innovations able to be integrated in the training implementation, which is presented in the following sub-section. This worked as a test to the methodology and at the same time as a prototype able to further on be integrated in LCEs to actively support in the training programmes definition and training execution support. Additionally, was integrated in LCEs portal a solution able to act as an observatory of the innovations creation combining industry 4.0 related technologies. It also comprises a service to support such creations from the trainees.

- Each Learning Center, in each country will be an Observatory of the Industry 4.0 involvement in its country.

- We defined in each Learning Center a dashboard with different KPIs:

    o Number of enterprise registered in the Learning Center
    o Number of salaries trained
    o Number of students trained
    o Number of modules concerned
    o ….

The user from the company can leave their feedback about a module when it is finished, then all the feedbacks can be seen in the dashboard page, it's the main part of the Learning Center Industry 4.0 Observatory.
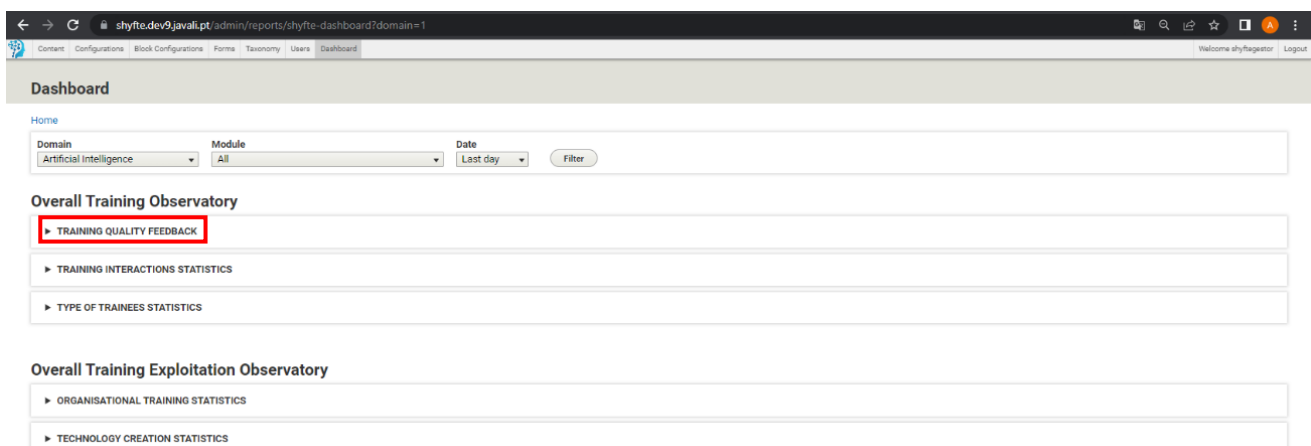
Figure 19 – Leaving feedback about a module.
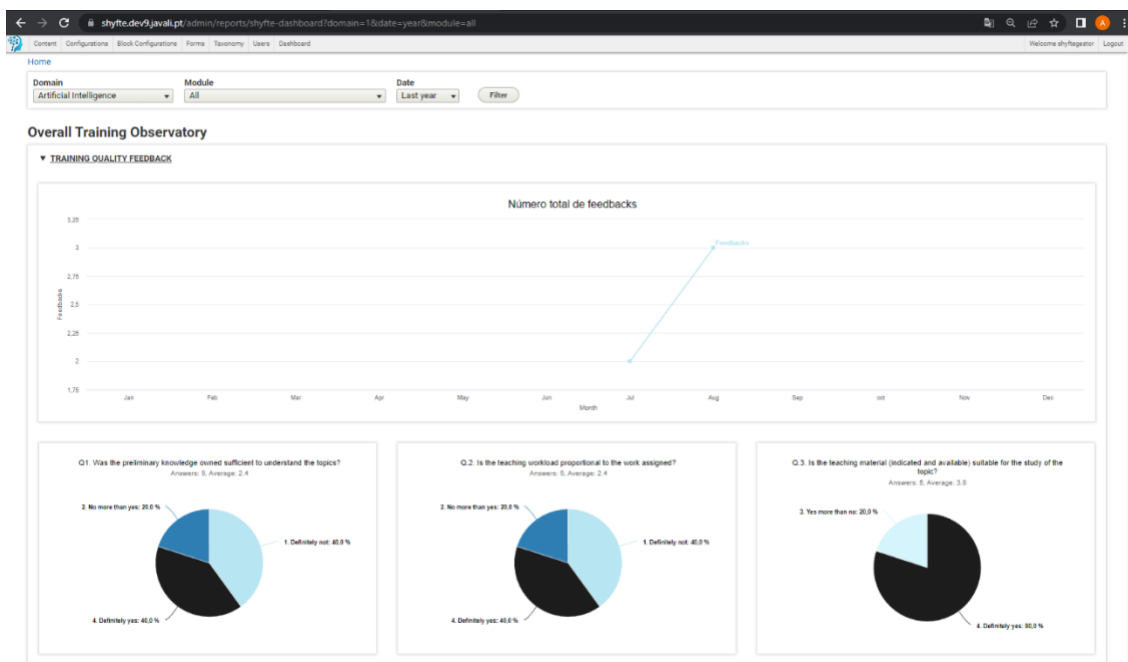
Figure 20– Overall training observatory.
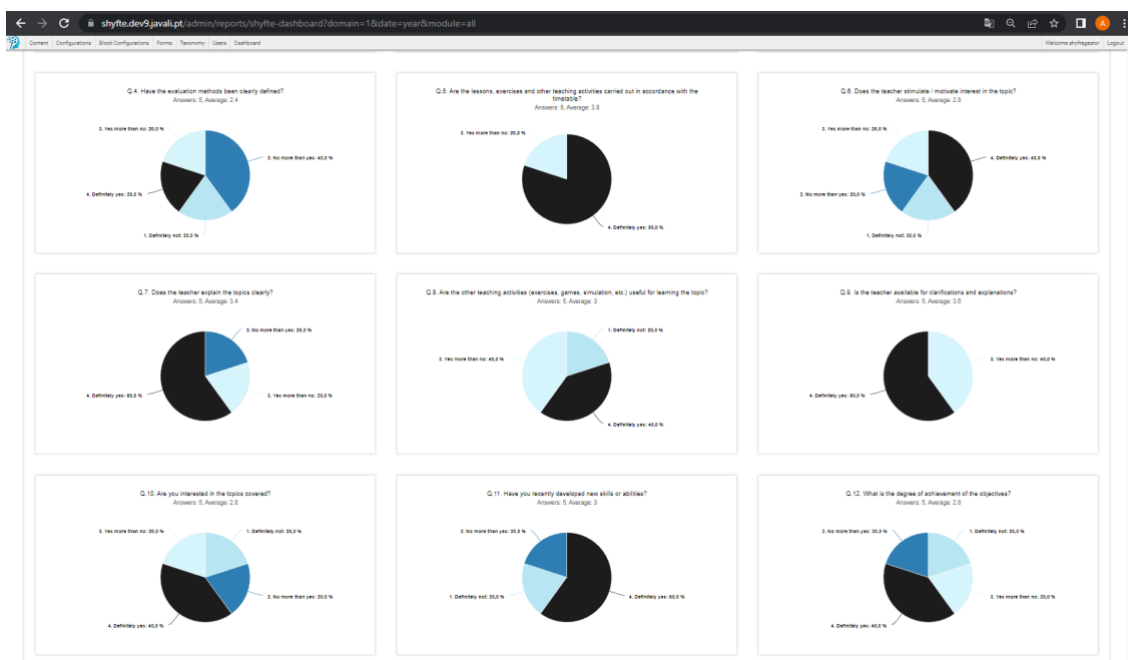
Figure 21 – Overall training observatory.

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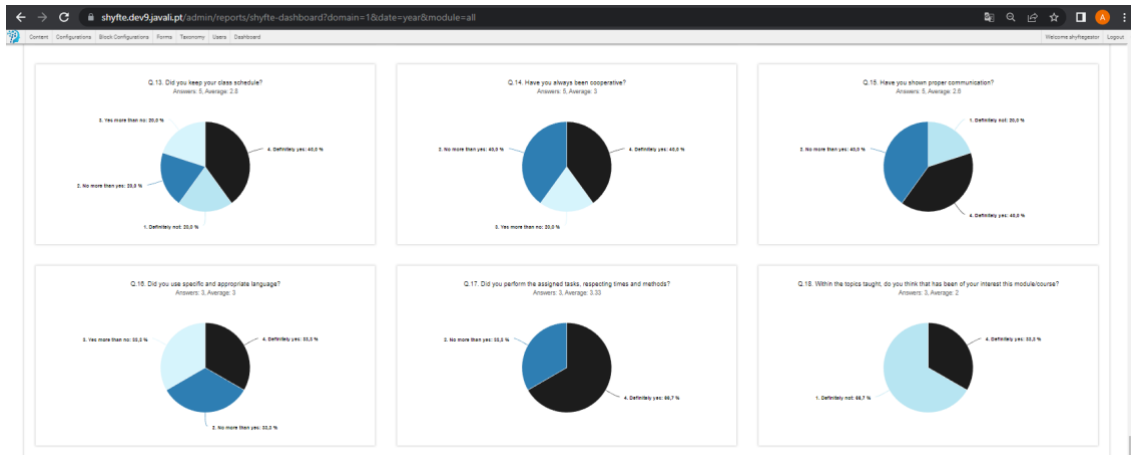
Figure 22 – Overall training observatory.

Also, an account with access to the dashboard already mentioned can check all the statistics regarding the interaction between the users and this form.

Figure 23 – Sample of training interactions statistics.

Figure 24 – Sample of type of training statistics.
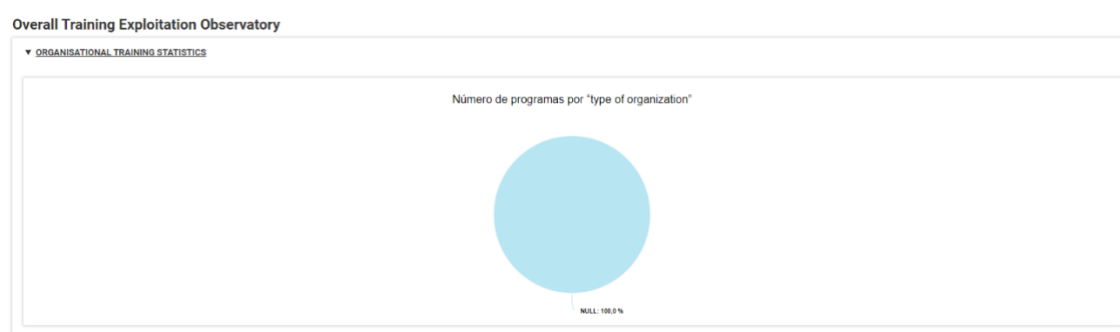
Figure 25 – Sample of overall training exploitation observatory.

4. The Technology Transfer (IP, patent, spin-offs…)

In SHYFTE, was developed a case study to demonstrate the development of innovations able to be integrated in the training implementation, which is presented in the following sub-section. This worked as a test to the methodology and at the same time as a prototype able to further on be integrated in LCEs to actively support in the training programmes definition and training execution support.

The Learning Center proposed a menu for the companies with a more innovative view about support and exists to help user's innovation that reflects the knowledge given by the learning center. This means that if the users have any problem with some project, either a prototype or just an idea, they can ask for extra help to all available trainers/researcher.

This way is possible to analyze information about know creators and innovation regarding the learning center.
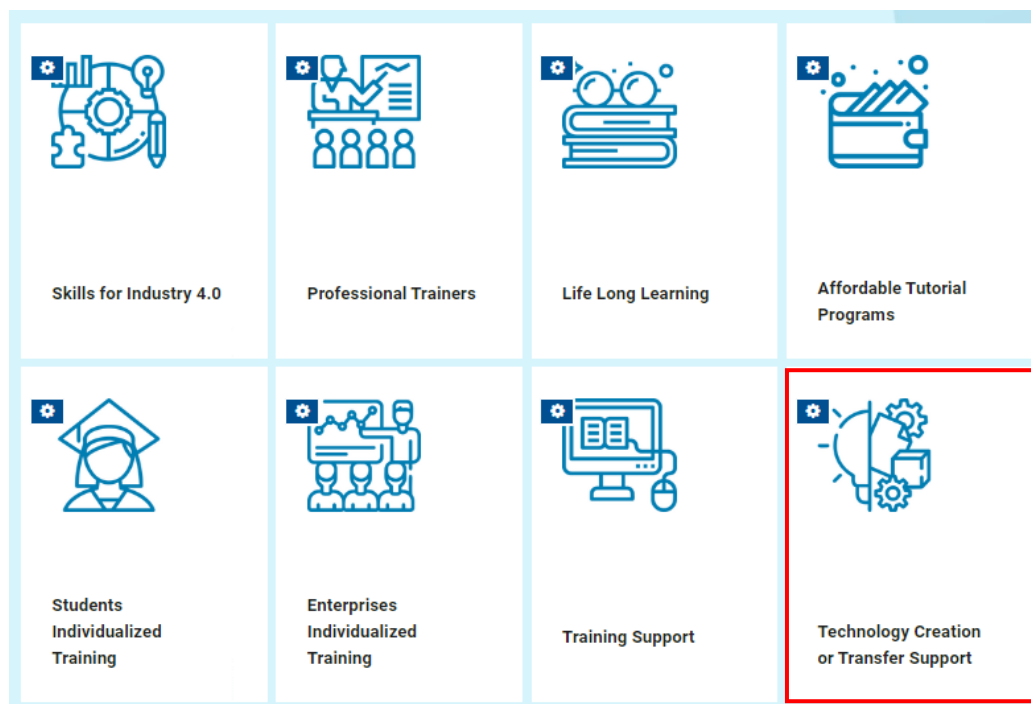
Figure 26 – Technology creation or transfer support.

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Technology Creation or Transfer Support

We have experts that can assist you in preparing your innovations, in terms of design, testing and exploitation. If you have any technical question you may consult us.

Contact us

Subject *
- Select -

Text *
Write your message

Submit

Figure 27 – Technology creation or transfer support.

Again, an account with access to the dashboard can check all the statistics regarding the interaction between the users and this form.
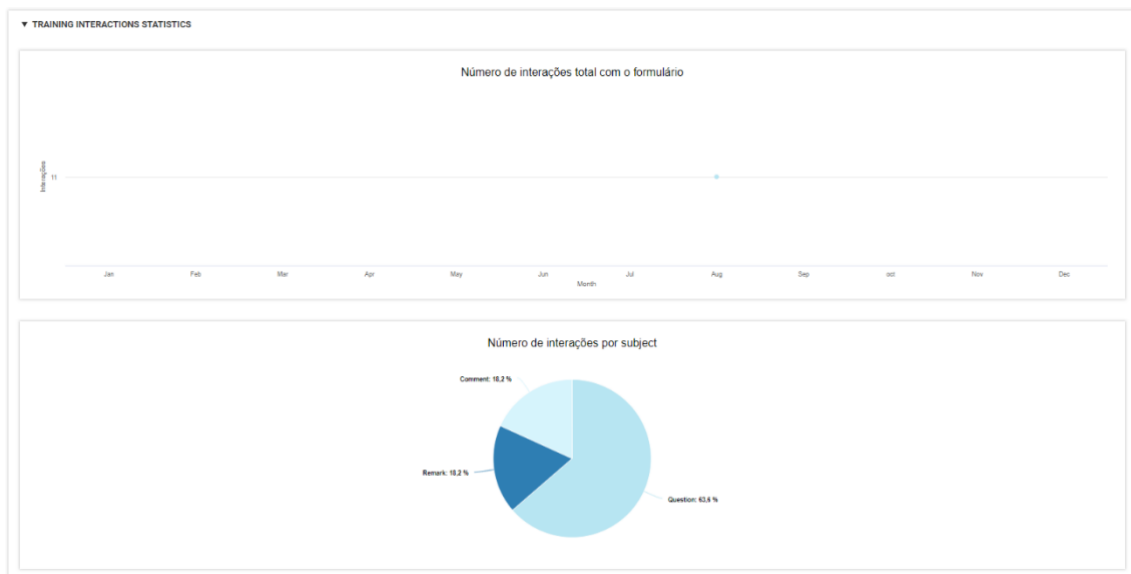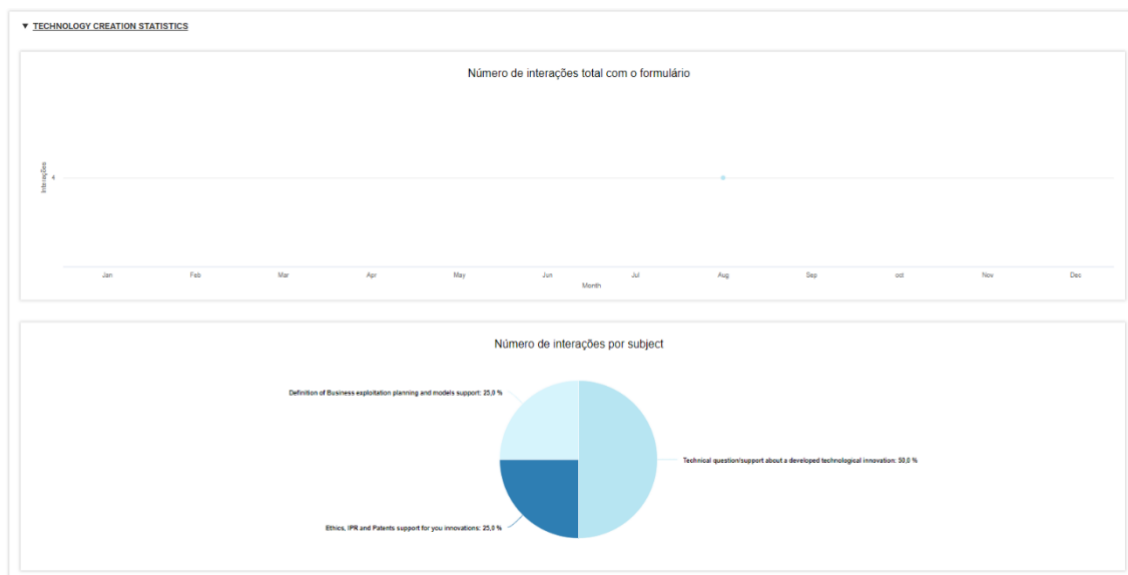

Figure 28 – Sample of technology creation statistics.

Finally, the Learning Center offers companies the opportunity to submit requests related to technology transfer via a specific contact form.

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This form allows them to propose their innovation ideas and to exchange with experts on the development of their projects.

Figure 29 – Technology Transfer Contact Form

The principle is to make the link between the Learning Centers and the Industrial observatory (the registred companies in the LC, the evaluation questionnaires…), and the Technology Transfer (innovation, creation…).

The next subsection aims to give an overview of the case study that is the object of this research, focusing on specific issues: problem, aim, scope, background, study design, results, discussion and conclusion, and further research. Following the step-by-step process makes it possible to determine the case study segmentally.
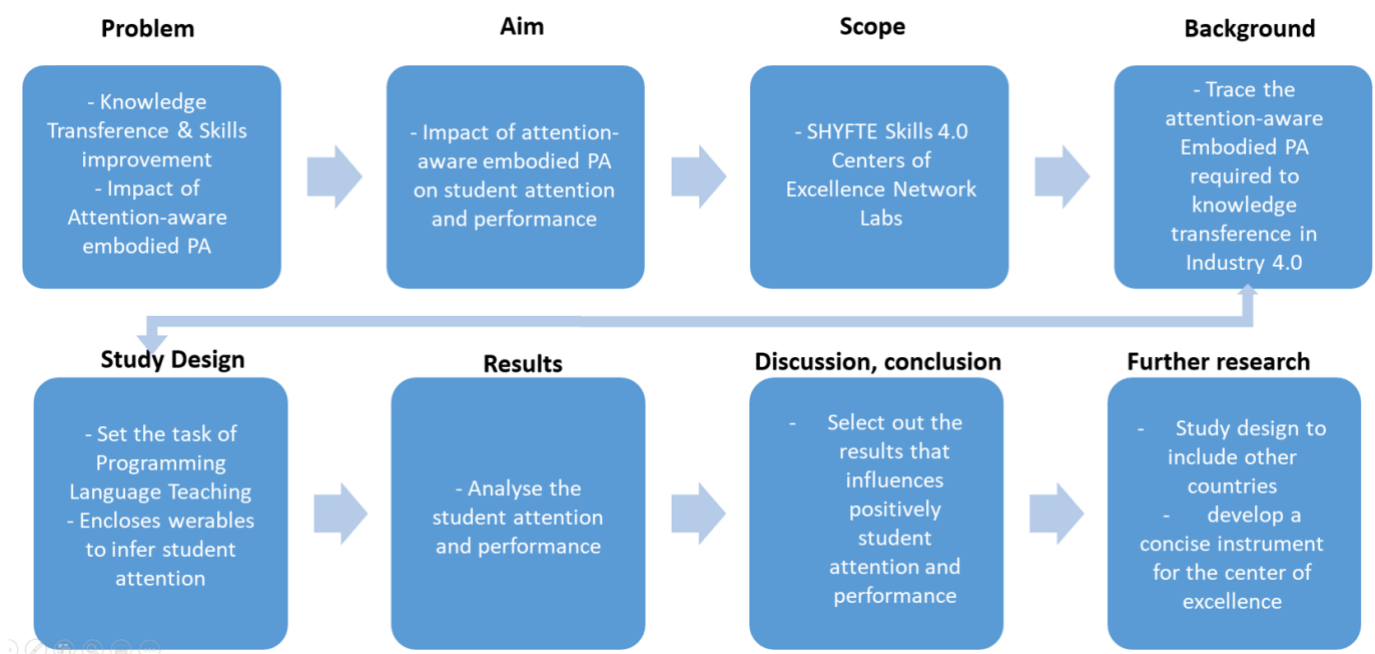
Figure 5 – Case study synthesis diagram.

The specification step of the Problem stage identifies the actual knowledge transference skills improvement opportunity in HEI. The research is dedicated to attention-aware embodied pedagogical agents. The case aims to study its impact on students' attention and performance. The scoping stage determines the scope of the study as the Centres of Excellence. The background stage traces the attention-aware Embodied Pedagogical Agent required for knowledge transference in Industry 4.0.

The study design stage allows determining attention-awareness to the task of Programming Language Teaching and then determines experimental online setting including wearables to infer student attention. The results stage is dedicated to the analysis of the student attention and performance. Next, results that positively influence student attention and performance are

selected, and results between evidence and the proposed framework are established. The further research stage proposes to enlarge the study to other regions and develop a concise instrument for SHYTE LCEs. These steps are described in more detail next.

- **Problem:** Currently, new challenges have appeared in the Higher Education ecosystem due to the Covid-19 pandemic situation. That raises an opportunity for online and virtual education to ameliorate skill sets with professional design in Industry 4.0 and new infrastructures. The "Building Skills 4.0 Through University and Enterprise Collaboration" project (SHYFTE) addresses knowledge transfer and student skills performance specifically, acting as a bridge between Industry 4.0 and HEI education, and creating the SHYFTE Centres of Excellence network, implemented with basis on a distributed architecture. To date, there is little research in the context of HEI education for Industry 4.0 knowledge transfer and students' skills improvement that examines the impact of Attention-Aware Embodied Pedagogical Agents on student attention and performance.

- **Aim:** In the context of virtual environments, it is known that the incorporation of pedagogical embodied agents can influence student attention. Choices and modifications for the design and modulation of the pedagogical agents influence dependent variables often studied in the field, such as academic success, motivation, and performance, appreciation, joy, interaction, and self-sufficiency. This research aims to study, knowledge transfer and skills, and the impact of attention-aware embodied pedagogical agents on student attention and performance, in the scope of Industry 4.0

- **Scope:** In Asia, the knowledge, and skills required for Industrial 4.0 empower workers for future challenges of new jobs that are appearing alongside technological advances. Nowadays it is important to create solutions, in operational, services, and technological levels simultaneously, at Higher Education Institutions (HEIs) capable of developing those competencies. In this context, the SHYFTE Skills 4.0 Centre of Excellence Network implements 4 pilot programmes in Asia: China, Thailand, and Malaysia. The study is limited to those SHYFTE Skills 4.0 Centre of Excellence Network Labs – four pilots programmes implemented in Asia: Thailand, China, Malaysia.

- **Background:** Tracing the attention-aware Embodied Pedagogical Agents required for knowledge transfer in Industry 4.0. Setting out known impacts of those agents on student

attention and performance. Identifying the key points and areas of debate in the research community regarding the specificity of the study. Creating and justifying research questions through identifying parameters settings for the task and dependent vs. independent variables that make it possible to justify the research questions.

- **Study Design:** The case study applies an attention-awareness embodied pedagogical agent to the learning task, supporting students through appropriate recommendations. The experimental online setting includes wearable technology (e.g. electroencephalogram, electrocardiogram, eye-tracker) that allow to infer and study the student's attention. The case study approach has suitable characteristics suitable for this research, since it allows blending both numerical and quantitative data, and the prototypical data of mixed methods research, enabling the identification of correlations between those elements. Specifically, it allows acquiring and studying the correlation between data acquired from wearables, questionnaires, and usability tests. Variables to be gathered are recorded at the SHYFTE Centres of Excellence. Through the implementation of the case-study approach, it is possible to determine and demonstrate an understanding of data collection.

- **Results:** Analyse student attention and performance in the determined task of computer programming language when support by attention-aware pedagogical embodied agents for knowledge transference and skills improvement.

- Discussion, conclusion: Select the results of the impact of attention-aware pedagogical embodied agents that positively influence student attention and performance, in the context of Industry 4.0 knowledge and skills transfer in Programming Language Teaching Tasks. Furthermore, clarify if it is possible to establish the connection between results provided from evidence and the theoretical proposed framework. Additionally, verify if it is possible to link the study to the expansion of the study to other countries LCEs.

The case study is described in the deliverable **D2.7: "**Evaluation of innovative solutions for training and exploitation".

5. Conclusion

This deliverable described the design of the network of centers of excellence and the Industry 4.0 observatory for each of the partner's region. It described also the system that support the creation of patents and spin-offs in such Skills 4.0 network centers.

To sustain the Learning Centers, one of the objectives was to create a network of Industry 4.0 Learning Centers by connecting them through a central site corresponding to the outputs of the Erasmus+ Shyfte 4.0 project.

The Skills 4.0 Learning Centers can be used as an observatory for technology transfer for the companies and promote innovation, patents, spin-off… Using the design and the functionalities of the LC:

- Industry 4.0 Observatory

- Dashboard and KPI's

- Technology transfer contact form

- …

To identify and sustain the company's technology transfer and innovation.

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