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Acronym: SEEtheSkills

Grant Agreement Number 101033743

HORIZON 2020

Report on upgrading BUILD UP Skills Advisor -

Final-

Deliverable 3.2

Date: 30-11-2022

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DISCLAIMER

ACKNOWLEDGEMENT

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Document information sheet	
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Deliverable number	D3.2
Deliverable title	Report on upgrading BUILD UP Skills Advisor
Description	This documents gives an overview on how the BUILD UP Skills advisor is and will be extended to suit the needs of the SEEtheSkills project
WP number	WP 3 – Creation of Integrated Register on EE skills
Related task	Task 3.2 Transferring and replication of training schemes between project partners through BUS Advisor app
Lead beneficiary	ISSO
Authors	Jan Cromwijk (ISSO)
Contributors	
Reviewers	Lihnida Stojanovska-Georgievska (UKIM)
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Status	Final

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v0.2	29-11-2022	Review by partners	Jan Cromwijk
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CONTENT

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033743"

EXECUTIVE SUMMARY

In this report an overview is given on how the BUILD UP Skills advisor is extended to suit the needs of the SEEtheSkills project.

The BUILD UP Skills advisor app (BUS-app) is an app with underlying database for providing personalized upskilling advice. It is developed with the purpose to inform and advise craftsmen and professionals working in the building sector; about upskilling opportunities around sustaining of the built environment.

The BUILD UP Skills advisor app was conceived in a project that has received funding from the European Union's Intelligent Energy – Europe (IEE) under grant agreement no IEE/12/BWI/335/SI2.659666 BUS_N@W

The BUILD UP Skills advisor app is used and extended in projects that received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No's
649737 (BUStoB), 649473 (PROF/TRAC), 754148 (NEWCOM), 745510 (BIMplement), 784972 (TripleA-reno), 892894 (BUSLeague), 101033740 (BUS-GoCircular), 101033743 (SEEtheSkills) and 101033864 (ARISE).

Development was co-financed by a Dutch education and training fund (Wij Techniek).

The developer is Geckotech www.geckotech.nl

In SEEtheSkills the database for storing training schemes will be built upon well-established BUS-app. The BUS-app will be implemented/filled with training schemes offered by partner institutions for which they have the ownership of IPR and will ensure transparent storage of available training schemes that will be part of open offer for upskilling of interested workers and professionals based on in SEEtheSkills the defined procedures. Functionality described will be developed based on the needs that pop-up during realization and testing of the Integrated SEEtheSkills repository.

The resulting database will be open for deposition of training offer by external parties, i.e. training providers that will express interest to promote their training offer through SEEtheSkills on-line repository of skills. For each training course relevant data will be stored that are necessary to ease replication of training schemes which is one of the expected results of the project.

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1. Introduction

The project "Sustainable EnErgy Skills in construction: Visible, Validated, Valuable" is an EU funded project under HORIZON 2020 programme, topic: **Stimulating demand for sustainable energy skills in the building sector**.

The overall objective is: **Challenging market acceptance and acting towards stimulation of demand of energy skills in construction through a novel 3V approach, to support need for energy efficient construction of new and renovation of existing building stock**

- **V1** To make skills **VISIBLE** through whole value chain in building sector by implementing an Integrated register of energy skills as cloud repository on interregional level, based on good practices from ongoing and recently finalised projects, that will result with increasing the number of skilled building professionals and/or blue collar workers;
- **V2** To **VALIDATE** skills relevance to standardized EE construction and interventions in renovation, by matching and leveling skills and linking them to national and EU qualification standards, to enable mutual recognition;
- **V3** To emphasize skills **VALUE** in order stimulating market demand for energy skills in design, construction and maintenance of buildings and manufacturing and installation of EE construction materials.

The content of this deliverable was created in 3 iterations.

1. ISSO provided a draft version based on the work done with ITEC on the integrated SEEtheSkills register.
2. The SEEtheSkills consortium partners followed a workshop on implementation of the BUS-app provided by ISSO and they did a review of the draft.
3. After processing comments from the partners by ISSO, UKIM did a final review.

Several modifications have been made to the BUS-app in order to be able to finetune its use for SEEtheSkills implementations. In the light of interconnectivity the most important modification was the adding of Learning Tools Interoperability.

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2. How it was decided which modifications where needed

Based on the workshop outcomes of the Consortium workshop in Barcelona held on 29.06.2022, a ranking of key functional requirements was made.

Figure 1 Ranking of key functional requirements of the necessary modifications of BUS App

Core functionality for finding professionals and companies:

1. Find professionals - 8.7 — Must have
2. Find companies - 8.4 — Must have
3. Find Professionals linked to materials 7.7 — Should have
4. Find Professionals/Companies with project references 6.8 — Nice to have

Core upskilling requirements

1. Benchmark myself on required skill levels - 8.1 — Must have
2. Generate learning pathways for upskilling - 7.4 — Nice to have
3. Earn Open Badges - 7.1 — Nice to have

Core technical requirements

1. Able to connect to existing E-RPL tools - 8.4 — Must have
2. Able to work with task based ULO's - 7.7 — Should have
3. Able to work with Open Badges for E-RPL - 7.7 — Should have

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In Table 1 these requirements where matched with the existing functionality of the BUS-app. Indicating the possibilities and ranking of functional modifications or extensions needed.

Table 1 Functionality match with the BUS-app

Must Have		
Should Have		
Nice to Have		
No	**Required Functionality**	**BUS-app**
1	Find professionals	X
2	Find companies	X
3	Find Professionals linked to materials	
4	Find Professionals/Companies with project references	
5	Benchmark myself on required skill levels	X
6	Generate learning pathways for upskilling	X
7	Earn Open Badges	In development
8	Able to connect to existing E-RPL tools	
9	Able to work with task based ULO's	X
10	Able to work with Open Badges for E-RPL	
11	Fit for use at national and EU-level	X
12	Fit for replication in other countries	X
13	Maintainable at national level by national actors	X
14	Multilingual	X
15	Link of recognitions to underlying skills	X
16	A reference to the institute providing the proof	X
17	Interoperability, compatibility and mutual recognition	X
18	A ranking of professionals/companies	
19	Background of professionals/companies	
20	Connection with LinkedIn	
21	Customer rating	
22	Availability for work	
23	Insight in most demanded skills	

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Based on the overview in Table 1 an overview of still to be developed functional requirements was compiled in Table 2. This table clearly indicates where for SEEtheSkills the most relevant development opportunities are and what they entail.

Table 2 Address requirements for use of the BUS-app in the SEEtheSkills integrated register

Must Have		
Should Have		
Nice to Have		
No	**Required Functionality**	**BUS-app**
3	Find Professionals linked to materials	Provide API to Unit of Learning Outcomes endpoints
4	Find Professionals/Companies with project references	Train4Sustain European Skills Registry delivers this functionality
8	Able to connect to existing E-RPL tools	Provide LTI connection or API connection
10	Able to work with Open Badges for E-RPL	In H2020 ARISE Open Badge functionality is added to the BUS-app
18	A ranking of professionals/companies	Train4Sustain European Skills Registry delivers this functionality
19	Background of professionals/companies	Train4Sustain European Skills Registry delivers this functionality
20	Connection with LinkedIn	Not addressed
21	Customer rating	Not addressed
22	Availability for work	Can be addressed by adding field to personal profile
23	Insight in most demanded skills	Not addressed; can later be generated based on usage statistics

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3. Conceptual approach for addressing the functional requirements

Based on the defined functional requirements, the found functionalities at EU-level and the concept of the SEEtheSkills integrated solution. SEEtheSkills recommends in deliverable D3.4 a hybrid approach in which the Unit of Learning Outcome definitions can act as a harmonized linking pin at EU level. To do so an Application Programming Interface (API) will be developed as part of the integrated SEEtheSkills Register for professionals and companies. This enables us to make use of strengths within the TRAINEE professionals, the BUS-app and the Train4Sustain database solutions. This in order to harvest the benefits of already existing databases and enabling their interconnection with the involvement of adequate APIs, as an important decision making criteria should be the number of professionals already populated in the databases.

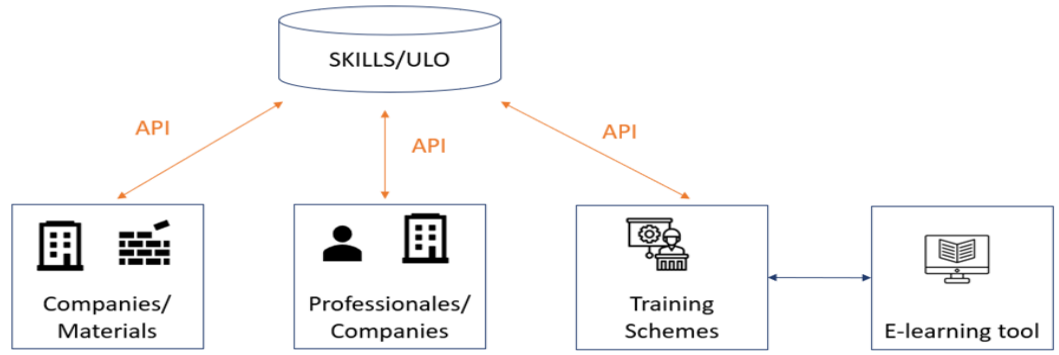

Figure 2 Scheme of API system in Cross-functionalities alternative, skills are the binding factor

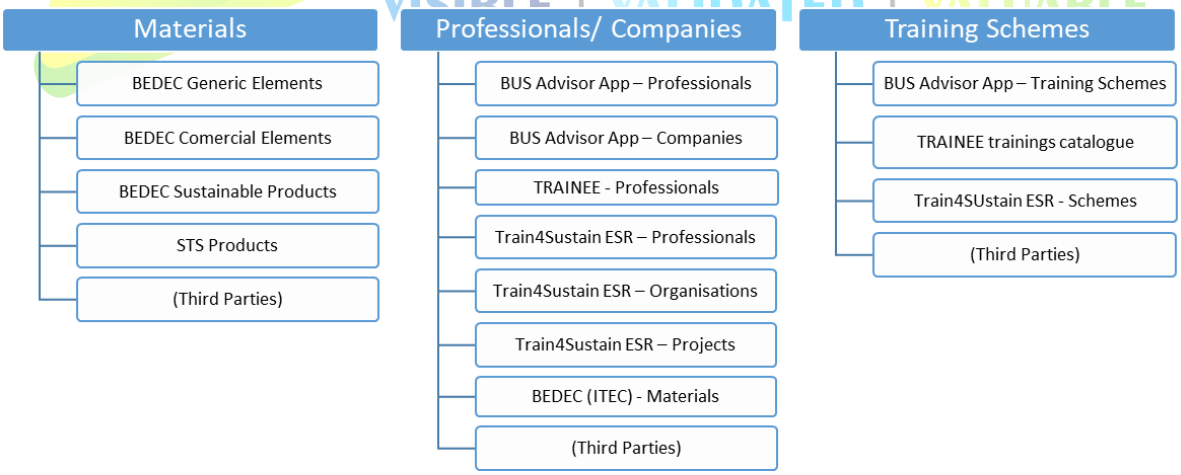

Figure 3 Several functionalities of the integrated SEEtheSkills register provided by different solutions

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4. Development of the functional modifications needed

In this chapter it is described how the functional modifications have been added to the BUS-app infrastructure.

4.1. Modification on Find Professionals linked to materials

3	Find Professionals linked to materials	Provide API to Unit of Learning Outcomes endpoints

By development of an API to retrieve the task based Unit of Learning Outcomes from the BUILD UP Skills advisor solution. Initial development of this functionality is done in the H2020 ARISE project as it is also a requirement for working with Open Badges.

4.2. Modification on connecting to existing E-RPL tools

8	Able to connect to existing E-RPL tools	Provide LTI connection and/or API connection

The functional requirement to connect to existing E-RPL tools can be addressed in at least three ways:

1. By using open badges with a verification link to the related Unit of Learning Outcomes
2. By providing an API for retrieving Unit of Learning Outcomes by their unique identifier.
3. By providing Learning Tools Interoperability for seamless and secure connection between a learning application and E-RPL tools

Open Badges and API-endpoints to Unit of Learning Outcomes are already developed in sister-project H2020 ARISE. Therefore in SEEtheSkills we have chosen to develop Learning Tools Interoperability (LTI). This due to the fact that LTI also allows training institutes to deliver seamlessly e-learning content connected with the BUS-app course repository. The platform that will be used is Moodle platform, operated by Knowledge and skills management centre K&S Centre.

Learning Tools Interoperability (**LTI**) is an education technology specification developed by the IMS Global Learning Consortium. It specifies a method for a learning system to invoke and to communicate with external systems. This enables the BUILD UP Skills app and therefore the SEEtheSkills integrated register to consume e-learning from external Learning Management Systems.

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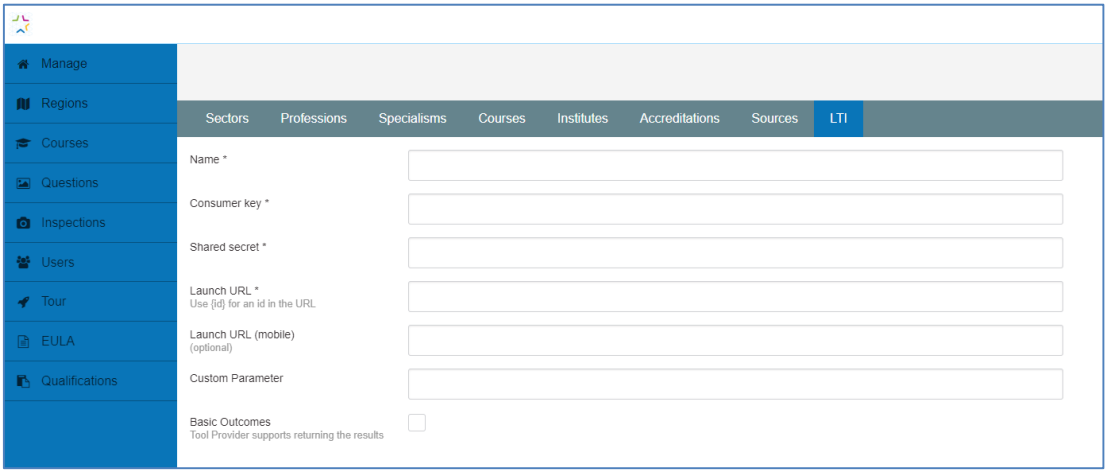

Figure 4 LTI functionality within BUS App

In order to make use of LTI an LTI configuration must be made at Course Institute or at Regional Level. This by providing the administrative input required. In most cases all parameters needed are provided by the Learning Management System. When Basic Outcomes are supported then the BUS-app gets a signal back from the LMS when the e-learning was completed successfully (incl. grade).

When LTI settings have been done e-learnings making use of it can easily be added to the course repository. This by selecting the LMS and entering the proper e-learning module identification. On fig.5 and fig. 6 the example of using the LTI functionality in BUS App is illustrated.

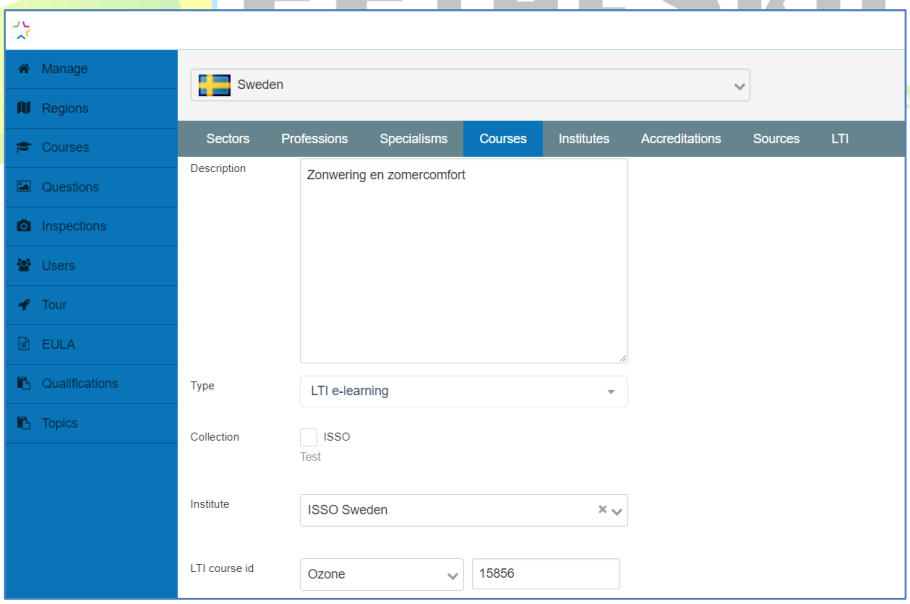

Figure 5 Example of enabled LTI functionality within BUS App

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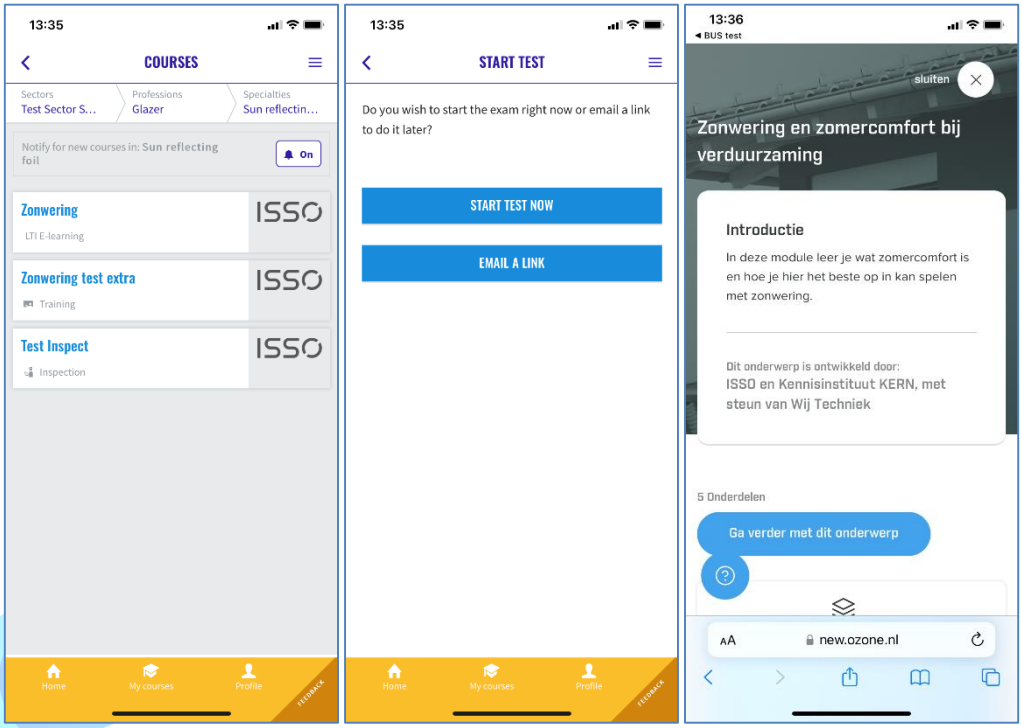

Several courses | Start the LTI course | Consume the e-learning

Figure 6 The sequence of connecting existing e-learning modules through enabled LTI functionality within BUS App

The learning tools interoperability setup of SEEtheSkills learning platform, will be ensured by the selection of a free and open source LMS that will be set as e-learning platform by the project. The platform that will be used is Moodle platform, operated by Knowledge and skills management centre K&S Centre, that is established in 2019 as an H2020 project outcome. The entrance to the LMS is directly through STS webpage. The learning opportunities will be organized as self guided microlearning pieces in 8 topics, explained in more detail in D3.6. E-learning platform within SEEtheSkills area. LTI performance of Moodle platform is ensured. In Moodle 2.2 onwards, the External tool enables users to interact with LTI-compliant learning resources and activities on other websites.

While, in Moodle 3.1 onwards, the Publish as LTI tool enrolment plugin and LTI authentication plugin allow remote users on a different site to access selected courses and activities on your site. When these users access an activity on your site, they need an account on your site and they need to be enrolled in the course containing the activity. Thus, an enrolment plugin AND an authentication plugin are required for LTI tool provider functionality.

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4.3. Modification on Open Badges

10	Able to work with Open Badges for E-RPL	In H2020 ARISE Open Badge functionality is added to the BUS-app

As this functionality is developed in H2020 ARISE there is no need to develop it in SEEtheSkills. When available at the end of 2022; it will be presented to the SEEtheSkills consortium.

4.4. Modification on availability

22	Availability for work	Can be addressed by adding field to personal profile

In the first series of modifications to the BUS-app this functionality was not added. When budget allows and Train4Sustain will not address it, this functionality will be added in the second half of the project.

4.5. Modification to enable insight in skills' demand

23	Insight in most demanded skills	Not addressed; can later be generated based on usage statistics

This functional requirement is not addressed due to a lack of usage data. When the SEEtheSkills integrated register is in testing phase the possibilities to address this function and where to address it will be explored.

Regarding the demand on specific training schemes, there are only some insights in the training schemes that will be most required based on the findings from the conducted survey on the status of energy skills, as reported in D2.1. Therefore, SEEtheSkills is in the process of preparation of microlearning content in form of short e-learning pieces on 8 different training schemes in BIM, RES and crosss-craft skills. These trainings will also be part of the BUS App content proposed by SEEtheSkills.

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5. SEEtheSkills input to BUS App

5.1. Input of training schemes

As the database for storing training schemes (one of the three linked databases within SEEtheSkills Integrated Register of skills) the well-established BUS Advisor will be used. BUS Advisor will be implemented/filled with training schemes offered by partner institutions for which they have the ownership of IPR and will ensure transparent storage of available training schemes that will be part of open offer for upskilling of interested workers and professionals based on the defined procedures in SEEtheSkills deliverable D2.2. Also the database will be open for deposition of training offer by external parties, i.e. training providers that will express interest to promote their training offer through SEEtheSkills on-line repository of skills. For each training course relevant data will be stored like duration of course, training content, training material, described approach in training delivery etc. that are necessary to ease replication of training schemes which is one of the expected results of the project.

SEEtheSkills will provide use of BUS App for the training schemes of partner institutions and the external parties, at the regional or country level, by assigning the responsible administrators for managing the content of the national training offer enabled by BUS App. The list of the prospective training schemes, proposed by project partners, to be included into the training offer of BUS App is given as an Annex 1 of this document.

Additionally, the 8 micro learning pieces that will be developed within SEEtheSkills project will be directly fed into the BUS App on EU level, provided as an open source training opportunities for the project duration. These training schemes will be organized as self-guided training opportunities, through Moodle platform selected by the project, that will be accessible through project website.

2 training schemes in RES qualification	1. Installation of PV systems in buildings
	2. Design of PV systems in buildings
2 webinars on BIM qualifications	3. BIM Certification vs Certification in BIM
	4. BIM skills – Necessary skills in Construction 4.0
2 webinars on BIM qualifications	5. Effective data collection for digitization of existing assets
	6. Effective coordination and clash-detection processes in pre-construction phase
2 webinars on cross-craft skills qualifications	7. Cross-craft skills for optimization of heating and cooling
	8. Cross-crafts kills for defects identification in the design phase

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5.2. Input in terms of defined ULOs for qualification

As previously explained in different instances, the task based units of learning outcomes ULOs will serve as an background baseline for defining the content of the training opportunities, and also to link the training schemes database with the database of certified professionals, acting as a sum of competences, skills and knowledge.

In BUS App, there are already defined qualifications with the content of ULOs that is behind them. ULOs are the statements regarding what a learner knows, understands and is able to do (including responsibility) on completion of a learning process, which are defined in terms of knowledge, skills and responsibility (attitude) (fig. 7).

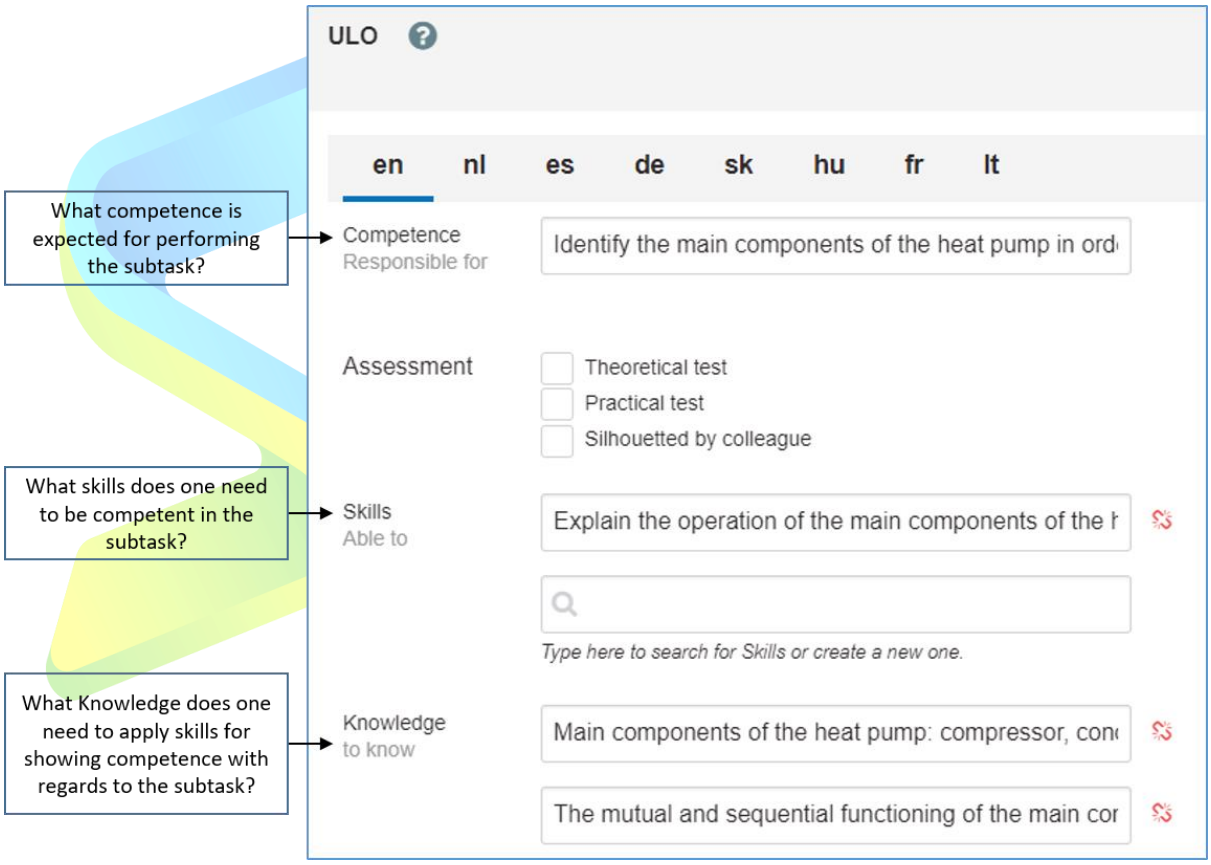

Fig. 7 An example of defined content of single ULO in BUS App

The list of current qualifications defined in BUS App is given in table 3. These qualifications are defined as content of task based ULOs.

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Table 3 List of ULO based qualifications in BUS App

	Overview of Qualifications in BUS Advisor App										
	Qualification Scheme	Language(s)								Status	#Tasks
		EN	NL	ES	DE	SK	HU	FR	IT		
1	nZEB ventilation	X								Complete	8
2	NEWCOM Building Inspector	X								Complete	13
3	Multifunctional roofs and façades	X	X							Work in progress	1
4	NEWCOM nZEB ventilation	X								Complete	23
5	NEWCOM nZEB Roofer	X	X		X	X	X			Complete	33
6	BuildingSMART professional certification	X	X							Dutch translation incomplete	5
7	Hydraulic balancing of heating systems (residential)	X	X							Complete	8
8	Heat pumps	X	X							Work in progress	4
9	Infrared heating	X	X							Complete	6
10	BUSLeague: Cross craft skills for sustaining buildings	X	X							Work in progress	27
11	BUS-GoCircular: Circular skills in construction (general framework)	X	X							To be added	9
12	BUS-GoCircular: Circular skills in construction (applied framework)	X	X							To be added	9
13	ARISE: BIM & Sustainable Energy Skills	X								Under development	
14	SEEtheSkills: Cross-craft skills	X								To be developed	
15	Fuse box aggrevation	X	X							To be added	6
16	EV Chargers	X	X							To be added	8
17	Connecting to heatnetworks	X	X							To be added	>20
18	Rainwater storage and re-use	X	X							Under development (Dec 2022)	
19	Hydrogen for heating	X	X							Under development (Sept 2022)	?
20	Sustaining of Cultural Heritage	X	X							Under development (sept 2022)	+-22
21	Airtight installer	X	X							To be added	6

The input for upgrading BUS App in terms of defining the ULOs content of qualification, that the project will give is the development of ULOs content for the RES specialist. The content of the RES specialist qualification is elaborated in Annex 2 of this document. Its elaboration in ULO based statements will be concluded in the following project implementation, and prior to the piloting of the functionalities of eRPL tool in March 2023.

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Annex 1 SEEtheSkills input of training schemes

The Netherlands

For the Netherlands the Course repository is filled with courses. This repository is regularly maintained and extended.

North Macedonia

Provider/ owner	**Knowledge and Skills Management Centre K&S Centre**		**MK**
Code of training	Title of the training	Duration	EQF level
	Thematic section: ENERGY EFFICIENCY		
EE1	Installer of electrical installations with skills for implementation of EE measures	80 hours	IV
EE2	Installer of systems for heat, ventilation and air conditioning with skills for implementation of EE measures	80 hours	IV
EE3	Graduated architectural engineer with skills for implementation of EE measures in design	16 hours	VI
	Thematic section: RENEWABLE ENERGY SOURCES		
RES1	Certified Designer of solar-thermal systems in buildings	80 hours	VI
RES2	Certified Installer of solar-thermal systems in buildings	80 hours	IV
RES3	Certified Designer of photovoltaic systems in buildings	80 hours	VI
RES4	Certified Installer of photovoltaic systems in buildings	80 hours	IV
	Thematic section: BUILDING INFORMATION MODELING - BIM		
BIM1	BIM for practitioners: engineers, architects and technicians	40 hours	VI
BIM2	BIM for decision makers, market, owners (on-line training)	15 hours	VI
BIM3	BIM for builders and contractors	40 hours	VI
BIM4	BIM for industry and manufacturers (on-line training)	15 hours	VI

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Spain

Provider/ owner	**ITeC ES**		
Code of training	Title of the training	Duration	EQF level
	Thematic section: databases		
BDC	BEDEC	6	V
TCQingcv	BEDEC-TCQ/TCQi budget for civil engineering	6	VI
-	BEDEC Maintenance	-	VI
-	BEDEC Sustainability	-	VI
	Thematic section: Building Information Modelling - BIM		
Pre-BIM	TCQ-BIM Multi-platform budgets	30	VI
Plan-Cert-BIM	TCQ-BIM Planning, certification and economic monitoring	30	VI
tcqbimga	TCQ-BIM Environmental Management	30	VI
PPBIM	First steps towards BIM	6	IV
VisualCost	Visualcost	6	V
	Thematic section: Sustainability		
PPS	First steps towards sustainability	6	IV
2S	Carbon footprint and trading	6	IV
SOSEE	Energy efficiency	6	IV
LSD	Digital sustainability	6	IV
	Thematic section: Maintenance		
MNT1	How to start with the maintenance of my buildings? Objectives and necessary information	6	IV
IM2	Asset maintenance: the organization and inventory of assets	6	IV
IM3	Types of maintenance, roles and building book	6	IV
-	DicPla – Building book, maintenance management plan	6	V
	Thematic section: Level(s)		
Level1	LEVEL(s) introduction	4	V
L2	LEVEL(s) Indicators	8	V
ll2	LEVEL(s) for public authorities and administrations	-	VI
	Thematic section: LEAN		
LPS	Last Planner System (LPS)	16	VII
IPD	Integrated Project Delivery (IPD)	12	VII
Provider/ owner	**Butic ES**		
	Thematic section: Building Information Modelling - BIM		
MBS	Master BIM en sostenibilidad oficial de Autodesk y Design Builder	5 months 219h	?
Provider/owner	**Espacio BIM ES**		
	Thematic section: Building Information Modelling - BIM		
MBS	Master BIM International Manager	2,5 months	?
Provider/	**Escola Sert**		

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owner	**ES**		
	Thematic section: Building Information Modelling - BIM		
MBS	Postgrado BIM Management	228 h	?
Provider/ owner	**UPC School** **ES**		
	Thematic section: Building Information Modelling - BIM and Energy Efficency		
MARQSOST	Master en Arquitectura y sostenibilidad: Diseño, simulación y control en edificios NZEB	9 month 454 h	?
Provider/ owner	**ECONOVA- Institute of Architecture and Engineering. Universitat de Barcelona** **ES**		
	Thematic section: Building Information Modelling - BIM and Energy Efficency		
? ?	Curso de simulación y eficiencia Energética BIM Curso de eficiencia Energética BIM	45 days 45 days	? ?
Provider/ owner	**LaSalle. Universidad Ramon Llull** **ES**		
	Thematic section: Energy Efficency		
?	Máster Universitario en Sostenibilidad y eficiencia energética	18 months	?
Provider/ owner	**UE. Universidad Europea Online** **ES**		
	Thematic section: Energy Efficency		
?	Curso Experto Universitario en Rehabilitación Energética de edificios- Online	4 months	
Provider/ owner	**Curso de Instalador.com** **ES**		
	Thematic section: Energy Efficency		
Mod. 0349	Eficiencia energética de instalaciones	100h	?
Provider/ owner	**Fomento Profesional (fomentoprofesional.com)** **ES**		
	Thematic section: Energy Efficency		
Mod. 0349	Módulo formativo de instalador de energía solar (térmica y fotovoltaica	?	?
Provider/ owner	**INESA Tech** **ES**		
	Thematic section: Energy Efficency		
	Especialización BIM en Gestión y Ejecución de Proyectos de Construcción Especialización en Modelado y Coordinación BIM de Proyectos Especialización BIM en Diseño Generativo y Computacional Curso de Planificación, Simulación y Presupuesto de Obra bajo Metodología BIM Máster en BIM Management Máster en Desarrollo de Proyectos BIM con Programación Visual	?	?

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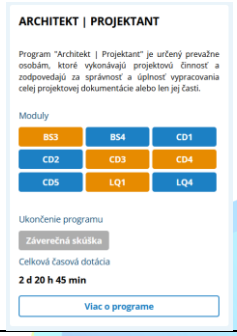
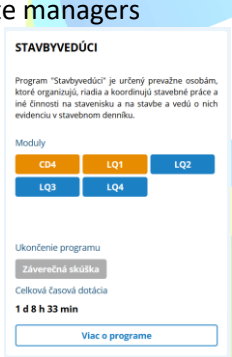
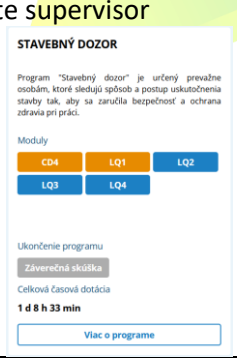
Slovenia

Project partners from Slovenia, are not working in the field of providing trainings, so there will not be an input into the BUS App.

Slovakia

Architects/Planners 	BS3 - Advanced building methods and tools BS4 - Non-residential and high performance building systems CD1 - Basic climate adaptive design CD2 - Advanced climate adaptive design CD3 – Internal Comfort and Indoor Air Quality CD4 – Green Construction Products CD5 – Building Physics and Energy Efficiency LQ1 - Project Life Cycle Management LQ4 – Legal Requirements	68 hod. 45 min.
Site managers 	CD4 – Green Construction Products LQ1 - Project Life Cycle Management LQ2 - Recycling and Waste Management on Site LQ3 – Quality Control LQ4 – Legal Requirements	32 hod. 33 min.
Site supervisor 	CD4 – Green Construction Products LQ1 - Project Life Cycle Management LQ2 - Recycling and Waste Management on Site LQ3 – Quality Control LQ4 – Legal Requirements	32 hod. 33 min.
Assessor of the achieved EE	AM3 - 2nd Generation of EPB standards and nZEB BS1 – Integrated Buildings Design BS2 – Renewable Energy Technologies BS3 – Advanced Building Methods and Tools CD5 – Building Physics and Energy Efficiency LQ4 – Legal Requirements	33 hod. 2 min.

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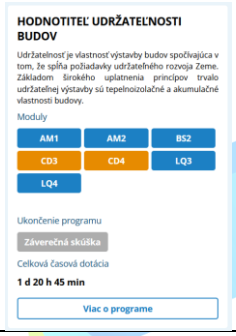
Sustainability/Energy advisor 	AM1 – Energy Certification and Building Certification AM2 – Life Cycle Assessments BS2 – Renewable Energy Technologies CD3 – Internal Comfort and Indoor Air Quality CD4 – Green Construction Products LQ3 – Quality Control LQ4 – Legal Requirements	44 hod. 45 min.

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Annex 2 The content of the RES specialist qualification to be rewritten in ULOs format

Provider/ owner	**Knowledge and Skills Management Centre** **K&S Centre**			**MK**
Code of training	Title of the training	Duration	Learning outcomes	EQF level
	Thematic section: RENEWABLE ENERGY SOURCES			
RES1	Certified Designer of solar-thermal systems in buildings	80 hours	1. The ability to identify systems and components specific to system's location, layout and configuration in order to provide an advice to the consumer and do planning of the most adequate system 2. The ability to define required installation area, orientation and tilt for solar water heater, taking account of shading, solar access, structural integrity and appropriateness for the building or climate 3. The ability to project the proper design of installation pipes, joints, sealing fittings and their positioning, adjusted to different roof types 4. The ability to plan maintenance and repairing and adjustment of the system in accordance to legal guidelines and evaluate commercial considerations The ability to work safely using the required tools and equipment and implementing safety codes and standards and to identify plumbing, electrical and other hazards.	VI
RES2	Certified Installer of solar-thermal systems in buildings	80 hours	1. The ability to identify systems and components specific to system's location, layout and configuration and to provide total cost quotation and commercial invoicing 2. The ability to prepare installation area, adjust orientation and tilt for solar water heater, based on the design of the solar-thermal system 3. The ability to install the mounting fixtures on a roof or an open surface and fix the module according to specifications of the manufacturer and join properly installation pipes, joints, sealing fittings 4. The ability to maintain, repair and adjust the system in accordance to legal guidelines and scheduled servicing	IV

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			5. The ability to work safely using the required tools and equipment and implementing safety codes and standards and to identify plumbing, electrical and other hazards.	
RES3	Certified Designer of photovoltaic systems in buildings	80 hours	1. The ability to identify systems and components specific to system's location, layout and configuration in order to provide an advice to the consumer and do planning of the most adequate system 2. The ability to define required installation area, orientation and tilt for PV module, taking account of shading, solar access, structural integrity and appropriateness for the building or climate 3. The ability to project the electrical design, including determining design currents, selecting appropriate conductor types and ratings for each electrical circuit, determining appropriate size, ratings and locations for all associated equipment and subsystems and selecting an appropriate interconnection point by using software 4. The ability to plan maintenance and repairing and adjustment of the system in accordance to legal guidelines and evaluate commercial considerations 5. The ability to work safely using the required tools and equipment and implementing safety codes and standards and to identify plumbing, electrical and other hazards.	VI
RES4	Certified Installer of photovoltaic systems in buildings	80 hours	1. The ability to identify systems and components specific to system's location, layout and configuration and to provide total cost quotation and commercial invoicing 2. The ability to prepare the required installation area, orientation and tilt for PV module, taking account of shading, solar access, structural integrity and appropriateness for the building or climate 3. The ability to install the mounting fixtures on a roof or an open surface and fix the module according to specifications of the manufacturer and join properly conductor lines, switches and other relevant equipment and subsystems and selecting an appropriate interconnection point according to the PV system design	IV

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			4. The ability to maintain, repair and adjust the system in accordance to legal guidelines and scheduled servicing 5. The ability to work safely using the required tools and equipment and implementing safety codes and standards and to identify plumbing, electrical and other hazards	