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Digital-Reskilling at Universities by introducing smart catalogues



Rationale of D-Reskill@U project

The "Digital-Reskilling at Universities (D-Reskill@U)" project, coordinated by Sorbonne University and of which the Budapest University of Technology and Economics is a partner member, is presented as a response to the changes, digitalisation and challenges that European training institutions are facing, specifically in the field of higher educational, digitalisation rapid AI development and employment crisis on the job market.

D-Reskill@U recognizes that the workforce needs effective up/reskilling and career guidance tools to enable them to enhance their employability in a period of rapidly changing work environment and innovative patterns. The solutions envisaged must be as effective and affordable as possible (to increase social inclusiveness). The project will provide European higher education institutions with guidelines for an original online further educational and lifelong learning offer at the post-graduate level for the reskilling and up-skilling of the workforce (manpower). To achieve the most in-depth and at the same time the most practical vision, the project collected a consortium of partners with different profiles, 2 research-intensive universities (Sorbonne Université and Università di Milano), a technical university (Budapest University of Technology and Economics), a distance-learning university (Universitat Oberta de Catalunya), together with a leading-edge EdTech company (Bullini Enterprise) in the field of digital HE guidance, and a non-profit foundation (Fondation Maison des Sciences de l'Homme) with expertise in digital transformation of higher education and dissemination.

Motivation

The D-RESKILL@U project is directly linked to the "European Skills Agenda" which prioritizes equity and inclusivity as a critical instrument of socioeconomic development and excellence. The Skills agenda assumes that public universities can play a central role in providing innovative continuous professional development (CPD) and lifelong learning (LLL) pathways that support targeted employability in crucial economic sectors. D-RESKILL@U is essential by providing a career guidance strategy for a CPD and lifelong learning pathway. The project is accessible, readily applicable, and responsive, thanks to its alignment with the European Skills/Competences, Qualifications, and Occupations (ESCO) database and its use of advanced digital tools for career guidance and support.

The digitalization of public organizations and private enterprise has driven economic growth across all sectors. In this context, CPD and lifelong learners need insights into the new and different skills they will need for career growth. According to a report from Gartner (2020), digitalization-driven skills shifts can be described by three central tendencies:

- New skills are emerging, driven by accelerating technological advancements. These skills include new-in-kind skills such as data analytics for business intelligence and blockchain.

- Skills are evolving: As companies continue to embrace big data, employees with statistics and analytics backgrounds who have applied their skills through more legacy programs like Statistical Package for Social Scientists (SPSS) and Statistical Analysis System (SAS) are starting to shift toward big-data oriented tools like Python and Tableau. In this regard, Deming and Noray (2020) argue that "the overall rate of skill turnover is high. Among vacancies posted by the same firm for the same six-digit occupation, about 29% contained at least one new skill requirement in 2019 that was not required in 2007".
- Yesterday's skills are expiring: This category includes skills that technology can perform faster and cheaper than humans. Examples range from cold calling to manual sorting to designing for print advertising — and could soon include a range of knowledge-economy skills displaced by artificial intelligence and machine learning.

Objectives

The D-Reskill@U project took the "European Skills Agenda" head-on by prioritizing equity and inclusivity as critical instruments of socioeconomic development and excellence. It postulated that public universities could be crucial in providing innovative professional further educational development (CPD) and lifelong learning (LLL) formulae. D-RESKILL@U has been vital in this regard by providing the strategy for a CPD an LLL approach that is accessible, readily applicable, and responsive, thanks to its compliance with the European Skills/Competences, Qualifications, and Occupations (ESCO) database and its use of advanced digital tools for career guidance.

The three following objectives illustrate the highlights of the project and its strengths:

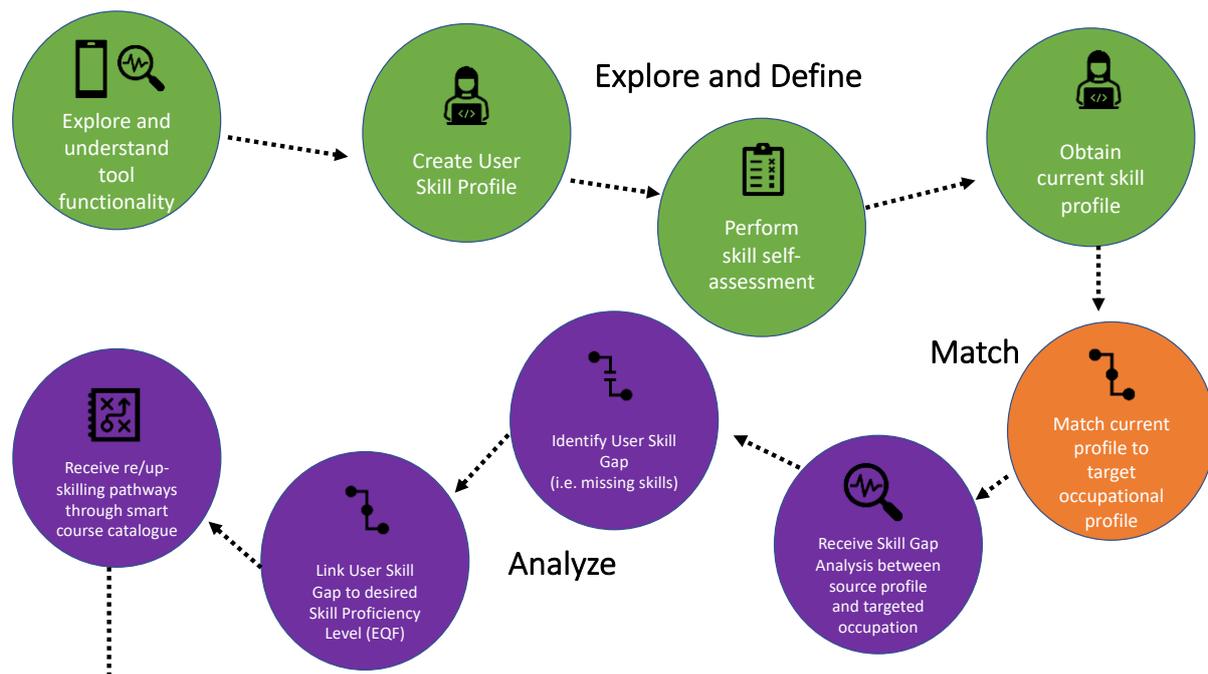
- The use of digital technology to make CPD and lifelong learning as inclusive as possible in the context of the current socioeconomic crisis triggered by the health crisis and its aftermath.
- The mock-up of an innovative learner-centered curriculum plan linked to the evolution of the European labor market and providing the methodological, technical, and strategic guidelines for implementing it.
- The maximization of impact via an active dissemination via Masterclass and Leadership School events to ensure visibility and continued sustainability.

Activities

Pedagogical Innovation for Lifelong Learning in Higher Education

A set of guidelines is implemented to determine the skills of a CPD and lifelong learning offer formulated to the needs of end users and to evaluate the corresponding micro-credentials concerning the European Credit Transfer System (ECTS) scale. In addition, the guidelines for constituting the "smart" Digital Catalogue are developed and provided. The skills gap analysis used analytical methods already implemented in our four universities, demonstrated in a pilot in the chemistry masters at Sorbonne Université, for example.

These catalogs are "smart" and linked to ESCO's ontologies, and they can feed digital tools that will guide the learner in building a learning pathway (see PR2) leading to ECTS credits. This catalog is sorted and marked by "keywords," allowing for its mapping to follow the ontologies of the European classification of Skills, Competences, Qualifications, and Occupations (ESCO) database (that is in open license). The catalog data (course name, skills, and training qualifications) are enriched by relevant semantic metadata and items, i.e., centers of interest, psychometric relevance and adequacy, and professional sectors). This metadata is of great value when users go through the self-positioning tests integrated into the software.



Modelling the Career Guidance Software

The software design is innovative in several ways. First, the Self-Positioning and Curriculum Building software tools integrate the database framework and the ontology of the European Skills/Competences Qualifications and Occupations (ESCO) in the same way as the "smart" catalog. Dynamic and progressive software features simulate curricular and educational outcomes (in particular, the earned credits) through a personalized user experience. In summary, the curriculum-building tool allows trainees not only to define a curriculum adapted to their skills and interests but also to count and calculate university credits while creating a study path. It is expected that digital tools will boost interest in our lifelong learning offers, as they will offer a unique means for effectively strategizing towards professional placement. Finally, as self-positioning practices are relatively common in the business world and, therefore, already familiar to the target audience, DRESKILL@U harnesses this effective practice that will become increasingly necessary in future university planning more in tune with individual learner needs.

The mass spectrometry example

CPD and LLL courses are already available at our universities. As a working example, we took two existing offers in mass spectrometry. These can be introductory (level 1) or more advanced courses (level 2) made over 2 or 3 days, with both "theory" and "practical" included (typically 14 hours). (for 1 ECTS = 25 hours, it is typically 0.5 ECTS). Mass spectrometry is inescapable in the training of an analytical chemist, and it exists in the ESCO base as "the analytical technique that makes use of the measurements performed at gas-phase ions and the ratio mass-to-charge." It follows the hierarchy: knowledge >natural sciences> mathematics and statistics>physical sciences>physics>mass spectrometry. It is declared optional for a chemical technician but needs to be included in the optional skills/competencies and knowledge of the targeted analytical chemist, while chromatography is!

Figure 1 This figure shows in the same table, a column with the proficiency levels required of a specific occupation (should be filled by industry experts) and two columns with the proficiency levels of skills and knowledge provided by trainings (should be filled by teachers).

	IN ESCO/ NOT IN ESCO	skill/kw	Industry Ready skill proficiency level for Analytical Chemist	LA SPECTROMÉTRIE DE MASSE COMME OUTIL ANALYTIQUE Lev1	LA SPECTROMÉTRIE DE MASSE COMME OUTIL ANALYTIQUE Lev2
use chromatography software	Available	skill	3	0	2
gas chromatography	Available	kw	3	0	3
apply liquid chromatography	Available	skill	3	0	3
gel permeation chromatography	Available	kw	2	0	0
high-performance liquid chromatography	Available	kw	2	0	3
laboratory techniques	Available	kw	3	1	3
conduct soil sample tests	Available	skill	3	1	3
mass spectrometry (fundamental principles)	Available	kw	4	3	4
prepare chemical samples	Available	skill	2	1	3
ionization methods	N/A	kw	3	3	4
vibrational spectroscopies (RAMAN, Infra Red..) (fundamental principles)	N/A	kw	3	0	0
apply vibrational spectroscopies methods	N/A	skill	3		
nuclear magnetic resonance	N/A	kw	2	0	0
UV-Visible spectroscopy	N/A	kw	3	0	0
XPS	N/A	kw	2	0	0
Photo luminescence	N/A	kw	2	0	0
solid NMR	N/A	kw	3	0	0
X-rays diffraction	N/A	kw	2	0	0
x-rays photo electron spectroscopy	N/A	kw	2	0	0
electronic microscopies	N/A	kw	2	0	0

Training program on Innovations in digital Lifelong Learning and career guidance

Through this training (held in Barcelona), Leaders, project partners, industrial partners, and faculty members could learn how to divide their course offerings into micro-credits, whose summation may lead to a degree. They will also learn how to clearly define their contents according to the "keywords" that allow mapping within the ESCO format to increase the reach of their offerings and boost their demand further. The training was continued with a Leadership School in Budapest to enhance our invitee's management and leadership skills.

Project results

The production of **guidelines** aims at defining skills-driven contents by skills-gap analysis and defining micro-credentials according to the analyzed Skills. As an application, a Smart Catalogue of online offers was produced in the fields of data sciences and chemistry.

The **production of the dynamic mock-up of the career guidance software**, consisting of the digital implementation of the **intelligent catalog**, the specifications of the career guidance software (dynamic modeling and interfaces designing).

The training program on "Innovations in digital Lifelong Learning and career guidance" took place in the form of two workshops: MasterClass in Barcelona and Leadership School in Budapest, aimed at university staff and their governance (leaders), as well as University partners, alumni associations, and corporate representatives.

Other outcomes resulting from the project are the continued dissemination of the D-RESKILL@U methodologies at the global level, the creation of an online kit describing the methodologies, and the implementation of the career guidance software and its testing when supplementary funding is raised in the post-Erasmus+ period.

Bibliography

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