






Education Mobility as a Service: Model of the Ecosystem

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Abstract. The paper describes the results of the study, the aim of which was to create an information model of an open-source network portal offering Gig education services to the academic workforce, students, and institutions to meet educational and employment needs by solving job and course search problems within the common EU education space. The model is constructed as a competence-based unit using digital standards, whereas its architecture is constructed considering further model's extension, enhancement, and User Experience recommendations of education management systems. The key contribution of this study is the model on the Web Portal as Open Education Resource, which makes the EU borderless online education mobility a reality by joining the main education market players in one virtual space on a continuous basis irrespective of geographical residence. This model integrates the EU values of social and professional justice, as students have more opportunities to satisfy their educational curiosity, while educators receive tools to overcome the lack of teaching, research, information, and financial opportunities in their current location.

Keywords: Education as a service · Mobility · e-competence framework · Competences · Gig economics · Ecosystem

1 Introduction

The creation of the European Digital single market without restrictions or barriers to access is a principal objective of Digital Agenda for Europe. Education at the vocational and tertiary levels should comply with such dynamic changes so that graduates can meet the needs of employers and the market [1, 2].

The pandemic has opened new challenges for the education market and revealed new needs of society. One of the contemporary safety nets for the workforce is provided by the opportunities of the Gig economy with its vast opportunities of flexible self-employment, often viewed as the next level of development of freelancing, and which can be defined as the economic opportunities that link any service providers and customers on a marketplace on specific demand instances [3]. In case of education, the Gig economy allows for the creation of networked information structures facilitating a direct linkage between student clients, education providers and teachers outside of rigidly limited formal educational structures. Such transformations form new mobility requirements for

education - receiving educational services without changing the participants' location, possibility of receiving such services at any time and agility of education mobility.

Obviously, there is a need to create a new education ecosystem - the education mobility as a service (henceforth - EMaaS). The EMaaS concept is proposed by the authors and is an extension of the education as a service (henceforth - EaaS) model. The paper describes the results of the study, the aim of which was to create an information model of EMaaS offering Gig education services to the academic workforce, students and institutions to meet educational and employment needs by solving job and course search problems within the common EU education space. The study is a continuation of the ERASMUS+ iSECRET project [4].

2 Related Works

2.1 Education-as-a Service Concept

The EaaS concept is currently being actively developed. The rapid development of modern technology is now outstripping the ability of universities to adapt their curricula to these requirements. The EaaS model offers students an alternative or addition to standard university programs and internships, on the one hand. On the other hand, the EaaS model helps enterprises formulate the actual requirements for the competences of future professionals, which increases the efficiency of adapting university programs to the dynamics of the labor market.

Some universities have already proposed to view learning as a service with all parties co-creating the service [5]. Students can become co-creators only if universities adopt a student-centered approach on the condition of students' taking responsibility for co-creating the learning process. To bridge the gap between universities and students' actions, it is suggested that marketing-oriented approaches be used with the focus on creating the academic environment that will satisfy students' needs [5].

Some researchers consider that in the future students will definitely know a set of competences they will have to have to obtain a job and their choice of programs will depend on whether universities will be able to offer programs consistent with students' expectations of competences and universities' abilities to convince students they develop such competences, indeed, and universities' agility to rapidly and continuously renew their courses and curricula [6]. Some features of the EaaS approach are already being implemented for computer sciences education, some specifics and recommendations of the transition to an EaaS education model for both universities and IT companies have been proposed [6].

Digital designs for EaaS have already been created [7]. Many authors focus primarily on technical aspects of the implementation of the EaaS concept, describing cloud technologies as the technical basis for its building, for example, by using Infrastructure-as-a-Service model [8]. Some researchers focus on the practical application of the concept at specific universities, for example, at the AP University Competence Center of the Technical University of Munchen [9]. The EaaS model is considered as a service superstructure over the service models, such as Infrastructure-as-a-Service (IaaS), Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) [9].

Overall, the current research mostly describes various aspects of the EaaS model either from a conceptual or technological angle. However, there is no description of the model from a holistic perspective, including pedagogical and organizational features, enabling the interaction of all users on EaaS platforms. Once EaaS platforms are described comprehensively, new opportunities for evolution of EaaS platform ecosystems emerge leading to EMaaS platform solutions.

2.2 Remote Mobility of Education During 4th Industrial Revolution

Another important prerequisite for the creation of EMaaS model is the ever-growing trend towards remote mobility of international students and teachers. Education being digitized, similar to other sectors of the economy, is a consequence of the 4th industrial revolution whose aim is to develop high-level professionals and students' competences consistent with societal needs [10]. Educational mobility is a component of internalization of education, also known as borderless educational services, offering flexible curricula [10] and which, therefore, might be more attuned to the immediate and foreseeable needs of the market. Traditional forms of higher and vocational education are subject to formal constraints of certification, licensing and accreditation, which impede education agility in contrast to educational platforms outside of formal education. The creation of EMaaS model on the European scale might be viewed either as the next level of development of formal education or an educational form that is alternative to formal education.

The context of COVID-19 pandemic has propelled the development of remote education when face-to-face training has been replaced by remote learning activities and globally more than 90% of higher education colleges and universities moved their on-site instructions to online teaching in 2020 [11]. The fact that education has not collapsed but has continued to offer its services proves the good capacity of remote education and points to business sustainability of the EMaaS concept.

Although there are various business models underlying the Gig economy services, on which the EMaaS model can be based, the basic concept on which such business models are built is rooted in the relationship with the Gig workforce that is viewed as independent contractors using Gig platforms to offer services when needed and in the amount needed, at a reduced cost of market entry, if at all, and with hardly any spending on marketing [3]. In line with the EMaaS concept of services on-demand, which is clearly a feature of Gig platforms [3], the EMaaS platform might be viewed as a platform-company, which can be viewed as part of the platform economy [12].

As for-profit generation, such platform-companies generate revenues via cloud digital intermediation and by substantially reduced costs of operations managed by algorithms, by transferring some business operation costs to platform users, by creating attractive network of markets for investors [13], by managing business operations [12]. The business growth of platform-companies typically proceeds via diversification of offered services and increasing the market share for the offered services [13]. Some other business models of educational platforms evolve around small tuition fees imposed on certification and registration of courses, paid offers of head hunting, generation of paid products based on user networking, e.g., conferences, paid offers of student performance data [14], examination charges, additional study resources [15]. Often education

platforms, such as Massive Open Online Courses (henceforth - MOOC) platforms, do not generate sufficient revenues for their producers, as it is the case with edX [14, 15]. The motivation of such platform commissioners, who tend to be public authorities and educational institutions, is to provide education to the population that otherwise might not be in the position to receive education [14, 15].

The existence of various business models of EMaaS educational platforms indicates business viability of the current project.

2.3 MOOC Platforms and Technological Capacities

The roots of the MOOC model lie with a new path of education launched in 2012 by P. Norvig and S. Thrun, professors of Stanford University, who decided to put their classes online free of charge. This gave impetus to the development of Massive Open Online Courses platforms, first of which were the online educational platforms Coursera, established by Stanford University as for-profit business, and edX, jointly opened by MIT and Harvard University as a non-for-profit platform [16]. Such platforms create public goods and benefits [16] and democratize education, thus, providing more opportunities for most members of the public irrespective of their location or personal and professional circumstances to fill in the gaps with their education.

As for the technical capabilities of technologies, they can fully satisfy the requirements of an educational ecosystem. Artificial intelligence (henceforth - AI) has been used for more than 30 years as an educational instrument capable of creating adaptive and customized learning environment integrating logical algorithm-based operations [17]. For example, the educational platform Cloud e-Lab runs scalable contents and accommodates extendable study modules [17]. Research has found that students' motivation to learn and students' understanding of the subject improve once computer technologies promote learning [18]. Computer technologies have introduced various forms of virtual reality simulation-based training and telementoring, which are considered to lower the negative impact of the human factor of inexperienced professionals and enhance learning experience [19].

The EMaaS model is the next step in development of such an approach to education because it introduces the concept of competences, mostly focuses on matching service provides not only of higher education but also of vocational and further education, and students and interns, is open to individual professionals independent of their institutions and institutions across Europe and offers internship options, which is particularly important for some sectors of economic activities, such as health care and technologies.

The aim of the article is to describe an EMaaS model, and its service-oriented ecosystem based on competences, students' needs and business-academy partnerships, the outcomes of which are courses and various types of employment offered within the framework of a unified European education and employment market.

3 Model of Ecosystem for the Education Mobility as a Service

3.1 Aim of Ecosystem for Education Mobility

The rapid development of technology creates new challenges for education and training systems in modern societies:

- business requires specialists with specific competences for specific contexts;
- students, when studying at a university, wish to receive a work specialization for specific areas, often being unaware of competences they require for specific work contexts (in addition to fundamental education in the relevant professional field);
- universities encounter the need to cooperate to “exchange” their lecturers for specific courses, when academic vacancies are not filled;
- collaboration between universities and businesses still has a gap regarding competences developed at universities and required by businesses, economies;
- a large group of senior professors who can no longer work at universities on a permanent basis, but who could teach high-quality courses at universities that are unable to fill-in their academic staff shortages;
- recent graduates of doctoral programs requiring adjunct positions to commence their careers in academia or wishing to combine employment in education with professional activities in other sectors of the economy and lacking adjunct opportunities;
- professional training centers ensuring the acquisition of professional competences that are outside the traditional scope of universities, yet, are in demand on the market, and whose services are not fully used by universities and students;
- impossibility of obtaining information on the principle of “one window” for both corporate and individual consumers of educational services, on the one hand, and for those who provide such services, on the other hand, for mutual satisfaction of needs in the field of academic education and professional training.

Such challenges negatively impact the quality of educational services, which the current model in the context of increasing requirements for the educational service mobility without changing the location of participants, on the one hand, and the possibility of receiving such services at any time, on the other hand. This creates a need for a new ecosystem - the education mobility as a service.

The possibilities of modern information technologies (AI, blockchain technology, etc.) yield the prerequisites for new adaptive properties of education services, verification of receiving education and training at different education establishments, such as universities and other legal training centers, new forms of educational mobility, etc. The architecture of the modern economy and technological advances allow for the creation of networked information structures facilitating a direct linkage between student clients, education providers and instructors outside rigidly limited formal educational structures. New forms of mobility encompass virtual services that form the foundation of the current EMaaS study, the practical aim of which is to demonstrate possibilities of an EaaS mobile education model with a demo portal developed on the principals of service-based, competence-based, student-centered education and business-academia partnerships for offering courses and various types of academic employment within one single European education and employment market (Fig. 1).

The key advantages of this model include the agility of its services created by a significant number of service providers and its focus on competences. Consistent with literature review, these two aspects form challenges for formal higher education programs and impede the transition of formal education to service-based operations.

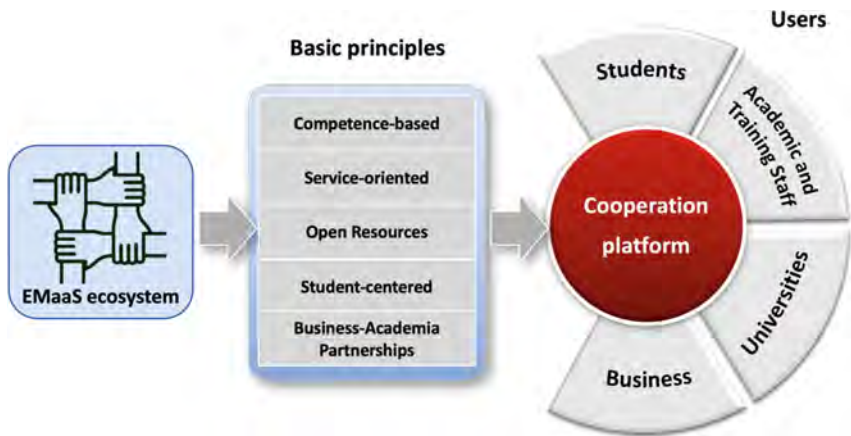


Fig. 1. Model of ecosystem for education mobility as a service.

3.2 EMaaS Model: Concept and Architecture

The open-source framework of EMaaS portal identifies key domains and capabilities required for digital delivery of education mobility services across the entire study lifecycle and provides a structure to facilitate relevant cross-institution cooperation. The feature of the entire study lifecycle requires the EMaaS model to span over several inter-related blocks at the (1) pedagogical, (2) organizational, (3) competence and (4) technological levels, which can be represented by a frame of models with the corresponding functionality (Fig. 2).

The EMaaS framework builds on the model of new demands to education and training already mentioned earlier. Institutional capabilities of education and business establishments are connected with individual expectations of students on obtaining professional competences across the lifecycle of professional activities initiated by the concepts of demand and the need of discovery and leading to implementation of the learning concepts, such as Learning Design, Learner Experience, Work and Lifelong Learning. The framework encompasses current capabilities, such as recruitment, curriculum design, assessment and career planning, and also looks ahead to future and emerging capacities of and for successful digital learning.

In what follows, model components are described in some detail.

Pedagogical/academic Components of the Model

The purpose of this model is to enable a comprehensive use of digital educational space and to facilitate online pedagogical technologies. One of the main drivers of educational mobility in the current situation (COVID, etc.) has been the lack of direct interaction between professors and students. New principles, approaches, norms and indicators are expected to apply to compensate for missing interaction. Thus, the pedagogical component of the EMaaS model focuses on the development of new remote pedagogical tools in a digital environment satisfying individual needs of students, which underlie their mobility, on the one hand, and on the preservation of socialization opportunities in the academic environment at a foreign university, on the other hand.

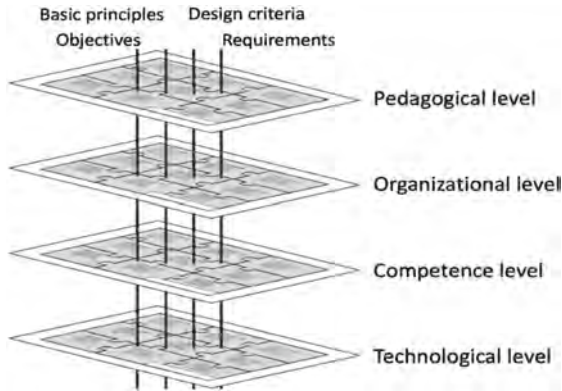


Fig. 2. Architecture of the EMaaS model.

Organizational Components of the Model

The conditions of limitation or partial termination of face-to-face contacts and instructions both at the students' home university and at the guest university create new barriers both in organizing the general mobility procedure and in managing the choice of their individual learning environment at the guest university. Therefore, the organizational component of the EMaaS model concentrates on the development of new organizational and management tools in a digital environment that satisfies individual needs of students underlying their mobility.

Competence Components of the Model

Work-Integrated Learning is a key aspect of the project with digital capabilities enabling virtual internships and remote competence-driven mentoring with industry professionals. This represents a bridge between employment and education and is an innovation of this project. The suggested competence model borrows the competence formula from CC2020 [20]: Competency = [Knowledge ("knowing what") + Skills ("knowing how") + Dispositions ("knowing why")] in Task. Career planning and placement services of the portal provide for skill assessment, skill matching and job search in virtual contexts. The portal supports networks and partnerships with industries, connects learners and professionals and facilitates access to industry expertise. It also supports institutions in their roles as education providers by supporting competence-based opportunities for learners at various stages of their professional development.

Technological Components of the Model

Remote mobility technologies imply the widespread use of new information technologies as a platform for the implementation of pedagogical and organizational tasks in the new digital mobility ecosystem. The platform functions, activating pedagogical, organizational and competence components, are enabled by new models of innovative IT technologies, combining various functions of already existing educational platforms and enhancing search options (blockchain, cloud, big data and AI technologies).

4 Conclusion

The main result of this study is the model of the Web Portal as Open Education Resource, which makes the EU borderless online education mobility a reality by joining the main education market players in one virtual space on a continuous basis irrespective of geographical residence of participants of the ecosystem. This model integrates the EU values of social and professional justice with creating information space and economic opportunities for a specific location but in the virtual space.

The creation of an ecosystem for mobile learning, which is proposed by the authors, and which has roots in a competence-based approach, contributes to solving several long-overdue tasks of higher education, which include the following aspects:

- Meeting individual educational needs of students, lecturers, and employees of businesses for the development of specific competences on the base of education mobility services during university studies and life-long learning.
- Promoting career development of lecturers which have their own values independently of academic institutions, their mission and vision which might not be aligned with the values and career aspirations of lecturers. This exchange will facilitate talent development and talent exchange across borders.
- Implementing a competence-based model of higher education into a digital reality offering service-based Gig borderless educational and employment opportunities.
- Creating an economic environment for implementing academic competences.
- Enabling lecturers to develop their professional competences in another European context, when the local market is either not interested in their knowledge and competences or is already saturated with professionals with such competences developed in the past when such competences were in demand.
- Developing knowledge and competences required on the European market, not only on their local market, thus, enhancing the quality of current and future education and competitiveness of students, staff and institutions.
- Offering opportunities for industries to find specialists consistent with their unique competence demands on the entire European common education market, not being restricted by generalized supply of knowledge constrained by local markets. This will boost economic development of the common European market.
- Offering mobile opportunities for individuals and corporate structures to obtain and offer services from other European countries, thus, merging education and business into a single agile “eduwork” space created by online activities.
- Providing academic institutions with an opportunity to recruit specialists with specific competences that they cannot find on the local market.
- Boosting educational competitiveness of small economies, such as Latvian, via open access to various educational and business European markets via lecturer and academic institutions employment in other European countries.

The creation of a single European digital platform integrating independent online services related to education and employment will create the basis for the development of a flexible, adaptive educational environment with open access. The network structure of this environment and the use of modern crypto protection means will allow to involve

almost the entire EU population in upskilling and reskilling processes based on the most advanced digital technologies in the interests of a common labor market in Europe.

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