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## RECOGNITION OF PRIOR LEARNING BASED ON COMPETENCE-BASED TRAINING IN AVIATION SECTOR

### ABSTRACT

*Higher education faces many challenges in the way of adapting to the labour market. In the aviation sector, the Competence-based training (CBT) concept and methodology has evolved over a long period of time to increase air traffic safety in all its segments. CBT is based on strictly prescribed standards in terms of theoretical knowledge and practical skills. These standards guarantee that the person can perform jobs prescribed by the workplace. This paper gives an overview of the concepts of recognition of prior learning (RPL) and CBT and proposes their inclusion in the higher education system. For this purpose, an example of ATCO training at the university level and the methodology used for RPL are presented.*

### KEY WORDS

*recognition of prior learning, competence-based training, higher education*

## 1. INTRODUCTION

The processes in society have greatly overcome the academic rigidity that is presently dominant in the higher education. The possibilities of on-line education today are easily assessable. Therefore, it is possible to obtain informal competences that are well-accepted in the labour market. Even though these opportunities are recognized, the academic community does not formally set out ways of recognizing such education in the absence of national regulations and other mechanisms that would provide universities with a safe entry into the process of recognition of competences acquired outside the higher education system.

Higher education is considered to be the basic instrument for stimulating competitiveness between individual regions and countries and has been identified as the central point for initiating changes that have encouraged transformations in the social, economic and cultural life of different countries [1]. At the turn of the 21st century, higher education, still regarded as the main innovator, underwent transformations in the direction of increased sensitivity to the needs of business environments. The 21st century marks the return to the development of the skills of future employees: such a view raises the possibility of focusing on the tertiary education system to meet the current needs of the economy. In a dynamic technological and economic environment, the need for lifelong education is increasingly emphasized. The rate of persons with higher education and increased mobility (geographical and

professional) among other things contributes to the development of societies. The new paradigms represent a major challenge for higher education institutions. Teaching aspect of higher education institutions should create favourable environment for the lifelong learning process and provide users with the necessary assistance during their lifetime. It is no longer enough to restructure curricula to meet the needs of the existing economic and social environment - simple adaptation of didactic forms will not be enough. It has become crucial to develop instruments of effective support for individual growth by opening up flexible and alternative pathways to personal development.

Depending on the reaction of universities to the increasingly complex and uncertain environment, European universities will fall into different categories. One of these categories, which is interesting for us, is the category of entrepreneurial universities that is characterised by a dynamic and interactive attitude towards the society. These universities are able to influence the environment to the same extent that the environment, in turn influences the environment. This is essential for the very complex aviation environment, in our case the process of knowledge and experience recognition. In this context, the systematic transfer of knowledge supplants the classical mission of research and education adding new missions: technology transfer, continuing education and adjustment to labour market demand [2].

An especially important qualitative leap is the abandonment of the idea that higher education degrees automatically guarantee high qualifications, which should enable the individual to achieve a lifelong professional success. The need for universities to become a part of the lifelong learning process is recognized in the Charter of Lifelong Learning, which was presented by the European University Association in the European Universities' Charter on Lifelong Learning in 2008 [3]. This document defines one of the basic ways of actively involving the university in lifelong learning concept - specifically by introducing the recognition of prior learning. In order to use all the potential and the benefits from higher education, it is essential for universities to develop systems to assess and recognize all forms of prior learning. This is particularly important in the context of lifelong learning in a global era where knowledge is acquired in many different forms and places [3].

There are many challenges ahead in reforming the education and training system, so that tomorrow's working population has needed skills and competences to meet labour market demands in a better way and to reduce unemployment. When analyzing the problems that employers encounter when they look for an adequately educated workforce, it should be pinpointed that the possession of skills represents the fourth factor/company growth risk and that 40% of employers in the EU do not find the employees they need until 27% of jobs remain vacant due to inadequate availability of potential employees on the labour market [4]. In a research conducted in the EU, knowledge-based learning (vocational education) has resulted in a reduced unemployment rate. Individuals who have completed vocational education find a job faster than those whose education is more general. Moreover, due to the digital revolution that has been incorporated into the education process, the generation Z has changed the attitude towards education. They have become the consumers of education who learn on the move (on the train, on the bus ...), outside the classroom and out of their homes. They do not refer to learning as a commitment but as an experiment. For entrepreneurial university it is a priority and a practice to respond to the challenges of society by creating new entrepreneurial academic structures as incubators, technology transfer centres, science parks and specialised department for lifelong learning [2]. By its proactive attitude, the entrepreneurial university is able to ensure an adequate response in terms of lifelong learning and learning outcomes for new jobs demanding new skills.

In the air transport sector, a highly regulated sector including very specific training institutions and comprising of a wide diversity of regulated occupations, which involve specific training and award of licenses, the development of university entrepreneurial attitude is very welcome for a better match between the labour market demand and the learning outcomes offered. Generally, but especially in aviation, training programs are distinguished by type, level and objectives of training. Hence, there is a need to determine very precisely the learning outcomes and to correlate them between the various

training options and to create also bridges between these training pathways. Recognition of competences and correlation of learning outcomes may provide support for designing coherent professional pathways and complementarity of general training in the aviation field, provided by high schools or universities and specific training for occupations in the sector.

When we refer to the air transportation, this subject does not follow the usual educational pattern due to the strict requirements of the industry which imposes the necessity of being licensed and certified in order to be able to work in such an environment. The major question arising is to what extent are universities capable of providing competent graduates ready for direct insertion in this highly regulated field of work? The following paragraph describes the main pathways for education and training.

There are two main pathways (Figure 1): the academic one, which consists in bachelor, master and doctorate study programs, which can be followed by or can alternate with postgraduate trainings; the vocational one, ensured by various training providers, such as airlines, handling companies, regulatory bodies, private trainers, in compliance with European Aviation Safety Agency (EASA) and International Civil Aviation Organization (ICAO) regulations. Our concern is to create as many bridges as possible between the two pathways [5].

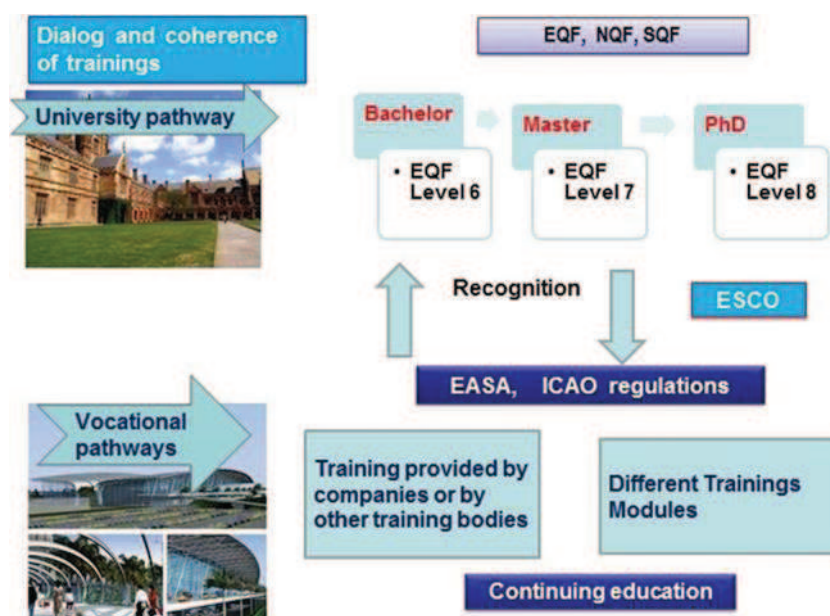


Figure 1 – Pathways for training in air transport  
Source [3].

Connection with university pathway and EASA/ICAO regulations are through EQF (European Qualification Framework), NQF (National Qualification Framework) and SQF (Sectoral Qualification Framework). Context of recognition of prior learning regarding those frameworks will be discussed in chapter 4.

## 2. RECOGNITION OF PRIOR LEARNING

Recognition of Prior Learning (RPL) includes evaluation of previously acquired learning outcomes and competences gained with previously acquired formal, non-formal and informal learning. Formal education or formal learning is defined as any institutional form of education, including practical training or qualification programs prescribed by law, necessary for the proper performance of a particular occupation.

University studies and programs are equally an integral part of formal education. Upon the completion of such education, a public document shall be issued stating that the holder has acquired certain qualification. Formal learning, which takes place in the educational institutions, is recognized by the national authorities, and as a result, diplomas, certificates and other form of public documents are issued. Formal learning framework is in accordance with educational regulations regarding teaching and other qualifications, or educational curricula.

The definition of non-formal learning encompasses all institutional forms of learning beyond the curriculum of education and training after which qualifications are acquired. Non-formal learning takes place outside formal learning environment but within some kind of organizational framework. It arises from learner's conscious decision to master a particular activity, skill or area of knowledge and is thus the result of intentional effort. But it does not need to follow a formal syllabus or be governed by an external accreditation and assessment [5]. It includes preschool education and postgraduate studies that enable the upgrading of knowledge within specific areas of education. Examples of this type of learning are training programs, programs funded by an employer who wants his employees to master new computer software, or courses for unemployed people who want to acquire / improve their knowledge in some areas, improving their position on the labour market. After such programs, no special qualifications or professional licenses are awarded, but their participants receive new information, deepen understanding of certain phenomena and shape their opinions and significantly develop other skills and abilities. A sum of completed training programs can result in acquisition of new competencies. For this reason, it is necessary to adequately formalize their recognition and evaluation. Non-formal learning is an addition to formal learning or to its alternative. For achieving this, it is necessary create a bond between a university policy and new academic structures, and practice and entrepreneurial management. The academic entrepreneurial structures as continuing education departments, technological parks or incubators offer to students an environment for non-formal learning by practical activities and direct application of knowledge leading to the achievement of new skills that facilitate the employability and flexibility on aviation labour market.

Informal learning refers to non-institutional learning, whether it takes place in a targeted or unintentional (unconscious) way. In a high technical society, there are many available information and knowledge resources that enable professional development for those interested. Informal learning takes place in everyday situations, in the family, in the workplace, in the community, or through the interests and private activities of individuals. It involves the acquisition of new competences beyond formal curricula conducted by an educational institution (without the help of lecturers / instructors / trainers), independently, with the aim of achieving specific learning outcomes and / or by involuntary (unconscious) learning. In some cases, informal learning uses the term experiential learning (which can be understood as practical, empirical learning), as it relates to acquiring knowledge through experience.

Recognition of pre-acquired sets or units of learning outcomes is a process recognizing the existence of units of learning outcomes in the register of national qualification's framework. This recognition is approved by a public document issued by an institution authorized to implement a program for acquiring or by an institution approved for evaluating sets of units of learning outcomes. Previously acquired unit of learning outcomes is the smallest unit of learning outcomes acquired by formal, non-formal and / or informal learning, and it is demonstrated in the evaluation process.

Validation of competencies previously acquired by formal, non-formal and informal learning (recognition of prior learning in a wider sense) is the process conducted according to the predefined and accepted criteria and standards and according to the national legislation. That criteria are defined by the relevant evaluation programs from the register that is a part of the national qualification framework. It also includes the procedures for issuing certificates of an authorized institution or organization which guarantee that they are able to perform the evaluation process and to possess the needed learning outcomes. The automatic recognition of previously achieved learning outcomes can also be carried out for learning outcomes that are not in the register of the national qualification

framework and are acquired through formal education and are proved by a public document issued by an authorized institution.

The program of validation of units of learning outcomes is a description of a standardized learning outcomes assessment process in relation to sets of learning outcomes and qualification standards from a national register. It outlines the learning outcomes, assessment methods, organization and duration of exams, the examiners, the insurance of the credibility of the valuation, etc. In many cases, the validation of acquired knowledge and experience is a mission of departments for continuously education working closely with stakeholders of the sector.

### 3. METHODS OF RPL

In order to enhance coherence of training in the air transport industry, a dialogue between university - trainer within the sector - employer is crucial for the joint development of tools defining learning outcomes for each training level, such as National Qualifications Framework (NQF), Sectoral Qualifications Framework (SQF) or other specific systems such as those used by Eurocontrol, Competence Based Assessment System (CBAS). The similarities of the two approaches, QF and CBAS consist in similarities in structure and descriptors of competences and in ways of achieving progression through qualifications levels. This theoretic attempt may be a first step towards highlighting the convergence between the two components, education and training, and it might lead to significant harmonization for the air transport field, a very interesting example due to the international standards and requirements strictly supervised by the international aviation bodies [6].

Although there are formal and extensive EU guidelines on setting up the valuation process associated with the NQF, some countries in Europe and around the world have put in place their practices and methods for supporting the evaluation. When analysing a broad spectrum of existing practices, three common valuation elements can be identified [7]. These are: identification, documentation and assessment of existing knowledge and skills and finally certification.

The identification process is most often supported by mentors / facilitators or other RPL experts whose task is to inform participants about the evaluation process, standards and documents that will be used within it. Through this process, the interested participant identifies the potential competences he possesses as well as the relevant evidence (i.e. previous achievements which are formally documented) if they exist. The process of identification is in most cases related to the desired qualification or to a set of integrated units of learning outcomes as participants tend to confirm the competences, they already possess in order to acquire specific qualification (either complete or partial) or to facilitate access to further education for the purpose of acquiring certain qualifications.

During the process of documenting, which is often accompanied by portfolio, all relevant formal and informal learning documents as well as relevant past achievements are gathered by a participant using a set of pre-defined relevant third-party standards, i.e. RPL providers.

The assessment process is critical to the evaluation because it uses the same standards for evaluating the competencies that an individual possesses according to a predefined learning outcomes list that are most often defined by the qualification standard. The recognition method can be divided into two groups: methods used to extract evidence and methods used to present evidence.

The two groups of methods are not clearly separated. It is sometimes difficult to classify other existing methods in one of these two groups. In order to get a better picture, the method of extracting evidence can be used to make individual competences visible, while other methods are used as an evidence of acquired competences. Cedefop's Glossary [6] provides a definition of the assessment process. It describes it as a process that includes all available methods to assess achievements of an individual or a group.

Based on the definition, one should be aware that there are different methods for determining the complexity and diversity of non-formal and informal learning. However, every available method should guarantee reliability, validity, fairness, the range of cognitive and practical skills and the appropriateness of purpose. To an RPL expert, the appropriateness of the purpose is the main factor when choosing among a variety of available methods. It helps to adjust the assessment method to the specific needs of the RPL candidate, while considering formal education requirements that could for example impose necessary set of integrated units of learning outcomes for specific qualifications and the technical limitations of such an approach.

For a better understanding of the difference between these two types of assessment methods, the quality of the evidence used during the evaluation should be emphasized. According to EU guidelines for evaluation of non-formal and informal learning, reliability, validity, authenticity and sufficiency are key elements of evaluating evidence [9].

An example of a good practice is France with a clear legislation for validation of knowledge and experience. Despite their good general experience, the validation is less efficient in aviation field.

#### **4. COMPETENCE-BASED TRAINING**

Concept of the Competence-Based Training (CBT) has been applied in aviation for several years. The concept and the methodology developed during the 1950s became a mainstream concept sometime in the 1980s [10]. The reason for applying this concept lies in the fact that a person who carries out certain tasks in aviation must meet strictly prescribed standards. Fulfilling these standards in terms of theoretical knowledge and practical skills is a prerequisite for person's licensing by a competent regulatory body, which guarantees that the person is able to perform jobs prescribed by the workplace.

The traditional way of training was based on the criterion of satisfying the minimum requirements for acquisition of certain knowledge, skills and attitudes, to achieve a certain qualification required for a license. This qualification can be in line with a formal assessment and validation process that is obtained when a competent body determines that the individual has achieved prescribed learning outcomes. This is the formal definition of qualification according to the European Qualification Framework or EQF [11]. CBT differs from the traditional way of training in a way that the individual possesses the necessary competences to safely, effectively and effectively perform assigned duties and responsibilities at the workplace. The CBT does not conceptually differ from the underlying EQF principle where a learning outcome is defined as a statement of what a learner knows, understands and is able to do upon the completion of a learning process. Learning outcomes are specified in three categories - as knowledge, skills and autonomy and responsibility [11]. This shows that qualifications - in different combinations – encompass a wide range of learning outcomes, including theoretical knowledge, practical and technical skills, and others. In Manual on Air Traffic Controller Competency-based Training and Assessment [12], ICAO defines knowledge, skills and attitude as follows:

- Knowledge: specific information required enabling a learner to develop and apply the skills and attitudes to recall facts, identify concepts, apply rules or principles, solve problems, and think creatively in working environment. Knowledge is an outcome of the learning process.
- Skill: an ability to perform an activity or action. It is often divided into three types: motor, cognitive and metacognitive skills. Skills are developed over time and with practice.
- Attitude: a continuous internal mental state or disposition that influences an individual's choice of personal action towards some object, person or event and that can be learned. Attitudes have affective components, cognitive aspects and behavioural consequences. To demonstrate the "right" attitude, a learner needs to know how to behave in a given context.

In this context competences are defined as a combination of skills, knowledge and attitudes required to perform a task to the prescribed standard. Standardization in aviation is of great

importance because it has a positive impact on the establishment and maintenance of a high-level uniform civil aviation safety. CBT actually enables that a person is trained and evaluated during a certain period (depending on the job he/she is trained for) in accordance with standards that define the levels of knowledge, skills and independence. The CBT and the assessment provide a clear picture what an individual can do (outcome of training), ensure that the prescribed standards are achieved and, what is very important for aviation, train people to know what should be done in their workplace.

Prior to the assessment, a candidate for CBT must undergo structured training to ensure that standards are achieved. These standards are defined as licenses, ratings or endorsements. Accordingly, training should be planned in such a way that the skills, knowledge and behaviours that are to be taught are elaborated in detail. In addition, the training plan should be structured in such a way to logically follow the training segments, explain the used methods and explain the way in which records will be kept. It is also necessary to elaborate how and when assessments should be performed. CBT Implementation Plans, that are structured in this way, should be supported by appropriate documentation and made available to training staff. Finally, the implementation of the plan must be monitored and controlled by responsible persons.

A person cannot be awarded an endorsement, a licence or a qualification unless the person is assessed in accordance with appropriate standards. In order to ensure the quality of the assessment, the set standards must be measurable, objective, valid, authentic, sufficient and current. Therefore, CBT and assessment procedures are the most important, rigorous and objective way of individual assessment in relation to the prescribed standard. Teaching methods may differ in different training organizations, but the final outcome must be that a trainee meets a consistent and appropriate standards and requirements.

Assessment is a process of comparing evidence of individual achievements with respect to the standard. According to [12], assessment means the evaluation of practical skills leading to the issue of the license, rating and / or endorsement (s) and their revalidation and / or renewal, including behaviour, and practical application of knowledge and understanding, being demonstrated by the person being evaluated.

Collecting evidence should be carried out according to established principles. This means that the evidence must cover all the performance criteria and knowledge of the standard being validated, that the evidence should be collected by the assessor (authenticity), sufficient evidence should be collected for establishing the competence of an individual and based on performance criteria and all aspects of competence (sufficiency).

## **5. RECOGNITION OF PRIOR LEARNING BASED ON COMPETENCE-BASED TRAINING**

Competence-based training can be used for recognition of prior learning in higher education. In addition, the qualification awarded by a higher education institution can be used to acquire the appropriate license or authority. Furthermore, an example of the university study program of Aeronautics is the program at the Faculty of Transport and Traffic Sciences of the University of Zagreb, where undergraduate study module for professional (commercial) pilots is structured in a way to follow the theoretical knowledge prescribed by the Acceptable Means of Compliances and Guidance Material to PART-FCL [13]. All the subjects prescribed by this document are included in the study program, with additional courses in which engineering skills and knowledge are developed. The program is Level 5 according to EQF and carries 180 ECTS credits. Upon student's request, the CAA may verify the frozen ATPL endorsement in a way to recognise Faculty exams in terms of the required level of theoretical knowledge. This is allowed only if the institution (the faculty/the program) is approved by the Agency. It is important to emphasize that the subjects of the study program are carried out in a much larger extent than prescribed by the regulation. The same methodology applies to the undergraduate study of Aeronautics for the ATCO module.

Based on the RPL methodology, it is possible to grant certain endorsements or licenses to persons who intend to enrol into the study program (modules for commercial pilot or ATCO). Thus, the process of evaluating informal and non-formal learning for enrolment and continuation of studies in the undergraduate study program of aeronautics applies only to those candidates who have completed four-year high school education before 2010 and who have or have had an air traffic controller license or appropriate commercial pilot licences. Based on such license, it is considered that the candidate successfully completed informal education that was organized and structured outside of the higher education system and that he / she acquired the relevant informal education with the scope of work of the license as an air traffic controller.

Determination and documentation of evidence is carried out based on an ATCO license [14]. The licence, which is not valid at the time of submission, confirms that the candidate has successfully completed non-formal education outside the institution of higher education. It is also an evidence of the competences acquired by the candidate and is treated as evidence from work or the physical evidence from work related to targeted or specific outcomes. This is an evaluation method used to extract evidence. The ATCO licence is the proof that the candidate has successfully completed basic training, rating training, and unit training. Additional evidence suggests that the candidate has completed continuation training and development training. For candidates who meet the requirements for enrolment (having completed four-year high school education), an assessment is carried out. The methodology and process of evaluating non-formal and informal learning is based on the guidelines for the practical implementation of RPL, which include:

- Initial information, orientation and determination of evaluation purpose
- Determination and brief documentation of evidence of prior learning
- Usage of an appropriate evaluation method
- Interpretation of evidence and assessment of achieved learning outcomes

Under certain conditions, the Faculty allows exemptions, as an ATCO candidate is considered accredited by the evaluation process. The exception refers to a total of 19 subjects/courses. The methodology is also applicable to candidates with a professional pilot license.

## 6. CONCLUSION

This paper gives an overview of the concepts of recognition of prior learning and Competence-based training. Presentation and elaboration of RPL is illustrated by an example of aeronautics study program. Although in this case licensed air traffic controllers enrol at a higher education institution with appropriate license which is based on the CBT, the concept can be applied to other professions in aviation sector.

Higher education institutions conducting recognition of prior learning should establish special organizational units that coordinate RPL process and ensure the quality and consistency of applied procedures. A good environment for developing the recognition of experience and knowledge is the entrepreneurial university, which by its organisation is able to give an adequate response to aviation demands. Regardless of the different denominations of these units, which depend on the functions performed within the university, all units aim at a successful implementation of the process of recognition of prior learning. Significant changes in the methods and practices of learning that characterize the knowledge society have led to the process of learning being no longer equal with formal education as such. This is a great challenge for formal education and education policies, as they now need to adapt to lifelong learning policies. Most countries around the world introduce a qualification framework that defines learning processes through the learning outcomes gained during education and training. Universities also need to adapt to changes in the fundamental understanding of educational processes and policies. When the results of informal and non-formal learning are recognized as potential equivalents to formal learning outcomes, this means that higher education



institutions gain a new feature, and the recognition of prior learning gives them the ability to help individuals obtain formal confirmation of learning outcomes outside the formal education system.

Even a brief analysis of a competence development, regardless the one we choose from the EQF approach or from the CBAS approach, shall lead us to the conclusion that both approaches involve the “Matrioska” principle: each level of competence must integrate the previous level and lead to a higher competence, which would indicate the progress and development of trainees from one module to another, and from one level of qualification to another. This approach in the design and understanding of the qualification as a building built by competence bricks, creating trinomial structures such as awareness – self-control – development, is common to both approaches and it may be an important advantage for harmonising all types of diplomas and licenses.

A new feature is also the offer of a new type of educational service. These services are based on establishing (through clear evidence and procedures) whether and to what degree an adult who has not completed a formal education process has mastered the specific learning outcomes that are achieved in formal education. The results may relate to the different curricula, modules and study groups available at a university. In order to properly coordinate the implementation of these specific services in the area of lifelong learning, it is necessary to meet at least two conditions: the first one is to have a legislation for this validation of knowledge and experience achievement and the second is to build up specific organisation and rules for implementation of recognition. The EQF, ESCO and CBAS create the premises for the implementation of recognition of prior learning and of experience achievements but the national legislation is essential for recognition. Institutions usually establish special organizational units in charge of recognition of prior learning (recognition centres) or for the entire lifelong learning activities of the university. They are supervised at the university level. The experience of some countries suggests that the recognition centres are established by the decision of the university administration, or within other lifelong learning projects or the recognition of previous learning undertaken at an institution of higher education. The main reason for setting up a recognition centre is that it is easier to manage the procedures for recognition of prior learning within the university if there is a unit in charge of coordinating them. It is also important to provide the appropriate conditions for managing the process of securing recognition quality within the university / faculty itself. The process of recognition of prior learning in any higher education institution can be broken down into several basic roles. Terminology can be slightly different from institution to institution - faculties and universities. Roles in the recognition process can be divided into administrative ones (coordinator, committee), counselling (advisor for recognition) and academic-didactic nature (evaluator). Depending on the regulations of the institution, the process of recognition may be more centralized (when coordinators and advisors work in the recognition centre) or decentralized (when consulting and evaluation itself take place at a faculty, department or institute). Depending on the specific needs of an institution, it is necessary to decide where the organizational structure will accommodate the unit for recognition of the previous learning. The unit can be located at the central level of the university / faculty and answer to (for example) the part of the department responsible for the teaching process. The Recognition Centre can be a part of a larger structure, such as a unit responsible for lifelong learning processes (Lifelong Learning Centre).

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