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proNET

Supporting inter-sectoral networks in the integration of university drop-outs into vocational education and training

Guidelines

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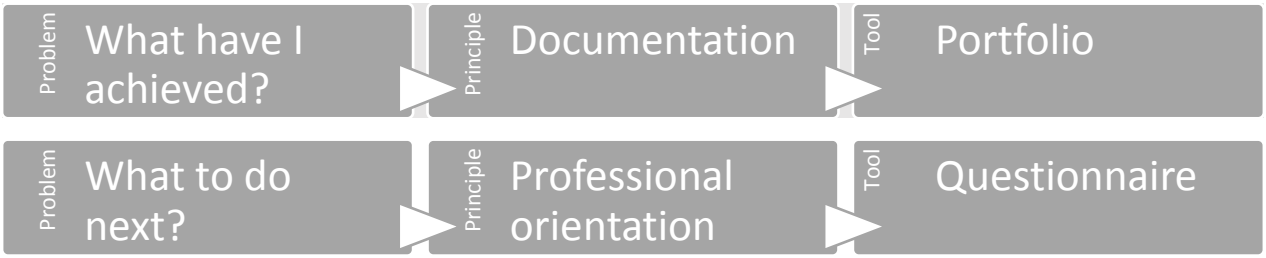
Introduction

These guidelines are developed within the ProNet Erasmus+ project (Pro Networks: Supporting inter-sectoral networks in the integration of university drop-outs into vocational education and training). The objective of the guidelines is to propose a working procedure for the creation of tools that allow the university drop-outs to document their previous learning outcomes and match these with potential occupations requiring VET. The design of the guidelines should be in conformity with the EQF and ESCO and complement both. During the ProNet project, they will be developed for the area of IT studies, as it registers high drop-out rates in some partner countries of the ProNet project. The objective for these guidelines is to propose a general approach that can be transferable to other professional fields in the future.

- In order to better understand the needs of the target group and different initiatives, policies and support networks that exist in partner countries, a synthetic report was elaborated with the analysis of the situation in every partner country. The following conclusions of this report, coordinated by the Universitat Autonoma de Barcelona, were considered in the conception of these guidelines:
- The **documentation approach** used in the tool should help the user systematically record the achievements in a granular way and present them as learning outcomes, rather than "subjects". The portfolio approach was selected, as it allows also the recording of different skills, knowledge and competences achieved outside of the formal learning.
- The **professional orientation approach**: motivation plays a major role in the phenomenon of university drop-out in all of the partner countries (for example, 38% of university drop-outs in France give "lack of interest" as the main reason for dropping out). Therefore, the factor of **motivations** should be taken into account in the guidelines, that should allow for a more open-ended outcome (e.g. openings for reorientation into VET programs in different professional fields). Our approach cannot be purely evaluative, but should also be focused on the **activation** of the user.

The guidelines should lead to the development of an online tool, that is used within a **structured career guidance process that leads to a choice** and should, at minimum, include the steps described in the final part of these guidelines

Figure 1: Basic principles of the ProNet online tool.



Integration of university dropout in VET system: transnational report

The transnational report is also available for download in full length

Report as overviews on the situation in the partner countries

The report on drop out and the integration of university dropout s in VET system is part of the project "Pro Networks (ProNet): Supporting inter-sectoral networks in the integration of university drop-outs into vocational education and training" and it is carried out in the IO1 framework. The main aim is to create an overview on the current situation in the partner countries based on national reports.

National understanding of university drop-out

The brief analysis carried out about national understanding of university drop-out has confirmed, once again, not only the lack consensus on its significance, but also the lack of a standardized system for the measurement of dropout and the scarce importance of dropout and retention policies in some university systems.

However, the national reports highlight a significance and, in some countries, increasing percentage of students dropping-out of universities studies: 36% in France, 30% in the Czech Republic, 28% in Germany, 38% in Poland (number of students did not graduate from tertiary education) and 26.9% in Spain. This available data, justify the importance of developing strategies and tools for identifying risk groups and designing intervention proposals suitable for different groups and contexts.

Approaches and strategies to counsel university drop-out

In general, institutional strategies and initiatives to counsel university drop-out seem to be more frequent and thorough than the one developed at a national level, since just few countries have clear and public policies regarding dropout in Higher Education.

From all the strategies compiled, the most interesting for ProNET objectives are the psychopedagogical ones, which include academic and vocational guidance and counselling, personal development plans, psychopedagogical counsel services and institutional plans for improving teaching and tutoring quality.

Some other strategies are focused on the students' transition from secondary to tertiary education: provision of information and guidance on academic options, itineraries or knowledge areas, the promotion of self-knowledge and the training of learning strategies are also intensified.

(Policies) and initiatives to promote the integration of university students' drop out into the VET system

The topic of drop-out and the integration in VET system is in almost all the countries missing in the public discourse and education policy. An example in this sense is that none of the countries analysed mentioned relevant experiences in integration of dropout, which demonstrates that the subject has a relatively low level of priority at policy-making level.

However, the issue of students dropping out of university remains, for the moment, a topic of interest for individual universities and the corresponding ministries in the countries. Some of the countries analysed are carrying out public debates in topics with implication on dropout, such lifelong learning with some visible effects in the public agenda.

Initiatives to promote integration of dropouts in labour market are more frequent in the countries analysed. At the same time, measures to prevent dropout are commonly implemented in these countries. In this last category, informative sessions, re-orientation and guidance sessions or special second semesters are implemented in order to diminish or avoid university dropout. In addition, forums, agreements and cooperation networks of regional scope are starting to be designed.

Intersectoral networks in the field of drop out counselling

In the countries analysed there are some initiatives of collaboration between different agents in counselling dropout.

Collaboration aims by one hand to counsel shortage occupations and by the other hand to provide guidance and mentoring through personal and professional career projects with professionals from the targeted professional field.

In the countries analysed there are hardly any cross-industry and cross-state projects due to the national administrative structure and administrative issues, or because the early stage of the national policies and strategies addressing university dropouts.

However, some of examples of networks and collaboration between university and industry could be imported from connected contexts as adult education or lifelong learning.

Conclusions

The national reports demonstrate that there is an important number of university dropouts at national level and the interest in this topic is higher than ever. Moreover, there is little evidence on dropouts' professional or academic paths. For some of them the university dropout doesn't mean an obstacle for entering in the professional life, but there are no evidences on their trajectories on VET programmes. A future research questions derived from here is related to the reasons for what their first option is not VET alternatives.

In addition, national reports proved the co-existence of a range of **programmes** or actions implemented in order to council dropout, but only few are directly addressing the VET inclusion. Derived from this, a possible future research direction could be related to the mechanisms implemented at local level to recognize and transfer credits from university to VET system in order to stimulate and facilitate the inclusions of dropouts into vocational training.

Finally, national reports put in evidence that the development of **instruments** and approaches for the integration of university drop-outs are still in development. This conduct to the need to approach this subject in depth and to offer to the academic and professional community valid resources to address dropouts counselling and integration.

Building blocks of the online tool

Learning outcomes of the targeted university programs with high drop-out rate

The list of learning outcomes plays a crucial role in the development of the portfolio for the documentation of the learning outcomes gained during the university studies before the drop-out.

Learning outcomes of the different VET programs in the targeted occupational sectors

The learning outcomes from different VET programs in the ICT field will serve as items for the construction of the interest questionnaires that is based on the Holland professional types and that will allow the user to choose a VET program that corresponds to his motivations and personal predispositions. Thus the questionnaire allows to make a link between concrete learning outcomes and VET programs and user's motivations and personality and can increase his or her willingness to re-engage with the training.

List of occupations in the targeted professional sector (ESCO)

ESCO database of occupations is used in order to assure the transparency and the coherence in the comparison of the targeted occupations and VET programmes that are proposed to the user in different countries.

Holland typology of professional environments (RIASEC)

The theory of career development of John Holland is one of the most used theories used in career guidance. It is based on the premise that the career choice of an individual is based on his research of correspondence between his or her personality and the professional environments. People of the same personality type working together in a job create a work environment that fits their type. Holland's theory postulates six types of professional environments: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (e.g. RIASEC types). People search for environments where they can use their skills and abilities and express their values and attitudes. People who choose to work in an environment similar to their personality type are more likely to be successful and satisfied. The following table shows a brief description of the six professional types:

interests	*possible strengths*
REALISTIC (R)	
practical, manual work, using tools and machines, concrete results of work, movement, work in the field, "dirtying his hands"	skilful, technical, practical, perseverant, concrete, direct, honest
INTELECTUAL (I)	
learn new things, observe, understand, experiment, solve problems, educate oneself, intellectual activities	curious, analytical, critical, logical, calm, objective, doubtful, sensing, intellectual
ARTISTIC (A)	
create, express oneself, design, play, be free, use emotions, speak languages	creative, spontaneous, non-conformist, expressive, emotional, idealistic, original, impulsive, independent, intuitive
SOCIAL (S)	
help, take care of others, counsel, resolve problems of other people, educate others, work with people	pedagogical, empathetic, accepting, sympathetic, caring, jovial, communicative, team player
ENTREPRENEUR (E)	

manage, influence, convince, organize, sell, gain money, develop, argument, trade	ambitious, self-confident, good negotiator, good seller, dominant, full of energy, convincing, communicative
CONVENTIONAL (C)	
order things, systematize, count, respect orders and rules, control, work with data and numbers	organized, perseverant, methodical, conscious, hard-working, efficient, conservative, precise, fast execution

This theory of career development will serve as a framework for the construction of the questionnaire that leads to the identification of the preferred professional types of the user and gives him personalized recommendations in terms of VET programs. This theory is also a "glue" that puts together the different elements of the online tool. Different publications and online resources exist with more information on Holland codes (see for example the original book "The self directed search" by John L. Holland).

Process for the development of the online tool

The first part of the online tool (portfolio) should allow the user to document his or her learning outcomes achieved during his university studies or in non-formal and informal context.

The second part of the tool (questionnaire) should allow the user to analyse his or her motivations linked to different activities and functions in the ICT sector. The result of this analysis should be a personalized profile based on the Holland's typology. Based on this profile, the online tool should propose the drop-out specific and realistic opportunities and openings for reengaging with formal learning in VET.

The elaboration of this tool necessitates the following steps:

A. Preliminary steps:

1. Identification of the targeted sector
2. Collection of the curricula of university programs
3. Collection of the curricula of the corresponding VET programs in the targeted field

B. Development of the portfolio:

4. Elaboration of areas of competences and their documentation
5. (Documentation of the learning outcomes from non-formal and informal learning)

C. Development of the questionnaire:

6. Identification of occupations accessible through VET
7. Attribution of the Holland code to occupations (*optional*)
8. Classification of learning outcomes and occupations by RIASEC codes
9. Transforming items into a questionnaire
10. Development of the personalized suggestions (questionnaire results)

A. Preliminary steps

Step 1: Identification of the targeted sector

In the ProNet project this step was agreed on by the partners and the ICT sector was selected. The reasons for this choice were the relatively high drop-out rate in the first year of studies in some partner countries.

Step 2: Collection of the curricula of the university programs

In the second step, partners were asked to identify local partner universities that provide training programs in the targeted sector. 4 to 5 universities were identified by every partner:

Czechia	Bachelor´s study program: Informatics (ČVUT, Fakulta informačních technologií: Informatika)
	Bachelor´s study program: Informatics (VUT, Fakulta informačních technologií: Informatika)
	Bachelor´s study program: Informatics (Západočeská univerzita v Plzni: Informatika)
	Bachelor´s study program: Software engineering (Univerzita Tomáše Bati ve Zlíně: Softwarové inženýrství)
France	Bachelor in informatics - specialization health services (Université de Bourgogne)
	Professional Bachelor - Logistics, speciality IT systems in logistics (Université de Bourgogne)
	Professional Bachelor - IT systems and software, Speciality: Manager of enterprise IT systems (Université de Bourgogne)
	Professional bachelor - IT systems and software, speciality Intra/internet systems for entreprises (Université de Bourgogne)
Germany	B. Sc. Computer Science (Technische Universität Berlin)
	B. Sc. Business Informatics (Technische Universität Berlin)
	B. Sc. Computer Science (Humboldt-Universität Berlin)
	B. Sc. Computer Science (Freie Universität Berlin)
	B.Sc. Computer Science (Technische Hochschule Brandenburg)
Poland	Informatics, Bachelor's degree (Kielce University of Technology)
	Informatics, Bachelor's degree (AGH University of Science and Technology, Cracow)
	Teleinformatics-Bachelor's degree (AGH University of Science and Technology, Cracow)
	Informatics- Bachelor's degree (University of Warsaw)
	Informatics- Bachelor's degree (Cracow University of Technology)
Spain	Bachelor's Degree in Telecommunication Systems Engineering (UNIVERSITAT AUTÒNOMA DE BARCELONA)
	Bachelor's Degree in Computer Engineering (UNIVERSITAT AUTÒNOMA DE BARCELONA)
	Bachelor's Degree in Electronic Engineering for Telecommunication (UNIVERSITAT AUTÒNOMA DE BARCELONA)
	Bachelor's degree in Informatics Engineering (Universitat Politècnica de Cataluny)
	Bachelor's degree in Computer Engineering (Universitat de Barcelona)

Step 3: Collection of the curricula of the corresponding VET programs in the targeted field

Every transnational partner identified a certain number of higher VET programs in the targeted field. The descriptions of VET programs should contain a list of learning outcomes. In some cases, the Europass diploma supplement for the training program was used in order to facilitate the mutual comprehension. More than 30 VET programs were identified across partner countries.

B. Development of the portfolio

Step 4: Elaboration of the areas of competences (Documentation of the learning outcomes from the university studies)

We analysed the university programs from the ICT sector in partner countries and compiled the learning outcomes into several big areas of competences. For every competence area the user is presented a list of learning outcomes and he evaluates his mastery of the learning outcome on the 4-level scale:

1 *Not developed*
2 *Notions*
3 *Good knowledge*
4 *Mastery*

The following list of competence areas is proposed:

- Programming
- Software engineering
- Computers, machines and operating systems
- Mathematics and mathematical analysis
- Electronics

	ACHIEVED LEVEL			
AREA OF COMPETENCES: PROGRAMMING	*1*	*2*	*3*	*4*
Basic school algorithms: Euclid, Horner, solving linear and quadratic equations				
Alphabet, syntax and semantics of programming				
Using reals and Integers				
Types and values of a variable				
syntax and formal semantics (empty, assignment, conditional, iteration, selection, read, write, procedure call)				
Assertions and invariants: Hoare's logic, proving program correctness, Proving halting of a loop				
Using data types: arrays, records, sets, files, enumerate types, pointer types				
Functions and procedures: syntax and semantics				
Recursion: recursive definitions, application and implementation, proving correctness of recursive procedures				
Dynamic data structures (pointer types, pointer type representation of linked lists, basic list operations)				
Linear data structures: stacks and queues (array and list implementation of stacks and queues)				
Trees (implementation of trees od any of order, binary trees, tree traversals: prefix, infix, postfix)				
Others…				

Formal assessment - exam, project, task… (fill-in if appropriate)		
Type of assessment:	*Date:*	*Name of the teacher:*
Type of assessment:	*Date:*	*Name of the teacher:*
Type of assessment:	*Date:*	*Name of the teacher:*

AREA OF COMPETENCES: SOFTWARE ENGINEERING	*1*	*2*	*3*	*4*
	ACHIEVED LEVEL			
Software engineering history, basic notions, overview of development techniques.				
Software lifetime, models of software lifetime.				
Requirement analysis, methods of requirements specification, modelling techniques (Use Case Diagram).				
Structured analysis and design, methods, modelling techniques. Data-Flow Diagram (DFD) and Entity-Relationship Diagram (ERD).				
Object-oriented analysis and design, methods, modelling techniques. Unified Modelling Language (UML), Class Diagram and Object Diagram.				
Chosen modelling means of UML (Activity, Sequence, Communication, and Statechart Diagrams).				
Complex modelling with UML.				
Design patterns.				
Introduction to verification, validation, and testing.				
Agile methods of software development, basic principles of extreme programming and prototyping.				
Basic principles of software operation and maintenance.				
Introduction to software project management.				
Software quality, intellectual property rights, Software Engineering Code of Ethics.				
Object-oriented programming				
Others…				

Formal assessment - exam, project, task… (fill-in if appropriate)		
Type of assessment:	*Date:*	*Name of the teacher:*
Type of assessment:	*Date:*	*Name of the teacher:*
Type of assessment:	*Date:*	*Name of the teacher:*

AREA OF COMPETENCES: COMPUTERS, MACHINES AND OPERATING SYSTEMS	*1*	*2*	*3*	*4*
	ACHIEVED LEVEL			
Basic functions of a processor, machine language, symbolic language, assembler.				
Processor architecture - registers, operand, instruction format, memory addressing, interrupts.				
Processor architecture - transfers, arithmetical and logical instructions.				

Processor architecture - shifts and rotations, control transfer.					
Processor architecture - other instructions.					
Cache memory, virtual memory.					
Basics of low level programming, elementary control structures.					
Functions and calling conventions.					
Modular programming, libraries, operating system services.					
Coprocessor FPU - architecture, real number format, instruction set.					
Coprocessor FPU - instruction set, programming, examples.					
Compiler for assembler - pseudoinstructions, directives, expressions, operators, operands and macros.					
Basic functions of a processor, machine language, symbolic language, assembler.					
The UNIX operating system, the basic principles and structure of UNIX and kernel					
UNIX Shell basic commands, programs, scripts.					
File systems. The physical and logical structure of disks.					
Finite automata and the Kleene theorem on effective equivalence of finite automata and regular expressions.					
Universal computation models: Turing machines and variants.					
Others…					
Formal assessment - exam, project, task… (fill-in if appropriate)					
Type of assessment:	*Date:*	*Name of the teacher:*			
Type of assessment:	*Date:*	*Name of the teacher:*			
Type of assessment:	*Date:*	*Name of the teacher:*			

	ACHIEVED LEVEL			
AREA OF COMPETENCES: MATHEMATICS AND MATHEMATICAL ANALYSIS	*1*	*2*	*3*	*4*
Principles of proofs and main types of proofs				
Integers, Eudid’s algorithm, Bézout’s identity, prime numbers				
The technique of differentiation (a derivative of the sum, difference, product, quotient), a derivative of the function and derivative of the inverse function.				
Mean-value theorems (Rolle'a, Lagrange and Cauchy).				
Criteria monotonic differentiable function. L'Hôpital's rule. Local extremes.				
Derivatives of the second and higher orders, Taylor's formula with the rest in the form of Peano, Lagrange and Cauchy.				
Taylor polynomials exponential function, logarithms, sine, cosine, sine and Arkus Arkus tangent				
Reflective, symmetric and transitive closure. Equivalences and partitions. The partially ordered sets and lattices. The Hasse diagrams.				
Boolean algebras				
Matrices and matrix operations.				

The vector space					
Systems of linear equations.					
The inner product. Orthonormal systems of vectors. The orthogonal projection on a vector subspace.					
The elementary notions of the graph theory. Various representations of a graph.The Shortest path algorithm. The connectivity of graphs.					
Eulerian and Hamiltonian graphs. Planar and non-planar graphs.					
Gamma-function Euler formulas Wallis and Stirling.					
Others…					
Formal assessment - exam, project, task… (fill-in if appropriate)					
Type of assessment:	*Date:*	*Name of the teacher:*			
Type of assessment:	*Date:*	*Name of the teacher:*			
Type of assessment:	*Date:*	*Name of the teacher:*			

	ACHIEVED LEVEL			
AREA OF COMPETENCES: ELECTRONICS	*1*	*2*	*3*	*4*
Mathematical basis for electric circuits (analytic and numerical methods), terminology and quantities used in circuits.				
Laws in linear DC circuits (Ohm's Law, Kirchhoff's law)				
Electrical circuits of resistors with one and more directed voltage sources, analysis based on a method of simplification				
Theorems about substituted sources (Thévenin's theorem), method of loop's current and nodes voltages, superposition principle				
General description of RC, RL and RLC circuits. RC, RL and RLC circuits with sources of direct voltage. Transient processes				
Alternating voltages and Fourier's series, solution of RLC circuits. RLC circuits in impulse mode, frequency filters 3				
Dissipationless and dissipation lines. Spreading of signals on a line. Signal transmission				
Semiconducting components, bipolar technology, PN junction, diode				
Bipolar transistors, transistor as a switch				
Unipolar transistors, TTL and CMOS gates (logical levels, power)				
Operational amplifiers (perfect) with weighted resistant nets. Digital-to-analog converters. Analog-to-digital converters				
Overview of important electric circuits (voltage sources, stabilizers, oscillator, multioscilators, bi-stable flip-flop, Schmitt flip-flop, timer, comparator, transmitter, receiver). Microelectronics, principles of integrated circuits manufacturing				
Methods of measurement of electric and non-electric quantities. Modern measuring devices. Principles and application of measuring devices				
Others…				

Formal assessment - exam, project, task… (fill-in if appropriate)		
Type of assessment:	*Date:*	*Name of the teacher:*
Type of assessment:	*Date:*	*Name of the teacher:*
Type of assessment:	*Date:*	*Name of the teacher:*

It is important to include a possibility for the student to add different learning outcomes in every area. Also, it is possible to add separate section for the passed exams.

Step 5: Documentation of the learning outcomes from non-formal and informal learning

Most of the learning outcomes have a form of theoretical knowledge, but many university programs include project-oriented work already in the first semester. Also, drop-out might have acquired different knowledge, skills and competences outside of the University (in non-formal and informal contexts). In order to document the learning outcomes of these activities, we propose a second part of the portfolio, that would be closely linked to the Europass classification of competences:

Please, write down the skills and competences you gained at the university or in other contexts (non-university courses, summer jobs, internships, voluntary work, associations...). For every listed skill and competence, please include a detailed description of an experience, where you achieved it. Please be as specific as possible in the description of your activity and if applicable, include the following: approximate date of the experience, difficulties, context, results, assessment. *Example:* *November 2016 – leading a group project in software development (4 people). Group was motivated by my idea and chose a particularly hard assignment. Result: Presentation of the project and special appreciation of the leading professor (Name)*	
Social skills and competences refer to living and working with other people, in positions where communication is important and situations where teamwork is essential (for example culture and sports), in multicultural environments, etc..	
Organisational skills and competences refer to coordination and administration of people, projects and budgets; at work, in voluntary work (for example culture and sports) and at home, etc. Describe your organisational skills and competences, e.g. leadership	
Technical skills and competences refer to mastery of specific kinds of equipment, machinery, etc. other than computers, or to technical skills and competences in a	

specialised field (manufacturing industry, health, banking, etc.).	
Computer skills and competences refer to word processing and other applications, database searching, acquaintance with Internet, advanced skills (programming etc.). Describe your computer skills and competences, e.g.: good command of Microsoft Office™ tools (Word™, Excel™ and PowerPoint™);	
Artistic skills and competences: State here your artistic skills and competences which are an asset (music; writing; design, etc.).	
Other skills and competences: State here any other skill(s) and competence(s) which are an asset and are not mentioned under earlier headings (hobbies; sports, positions of responsibility in voluntary organisations)	

C. Development of the questionnaire

Step 6: Identification of occupations accessible through VET

A list of occupations in the ICT sector was extracted from the ESCO classification (see https://ec.europa.eu/esco/portal/home). The current version of the ESCO classification (July 2016) contains 110 separate occupations sorted in the following fields:

- ICT analysis
- ICT deployment
- ICT design
- ICT documentation development
- ICT implementation
- ICT research and innovation
- ICT testing
- ICT business management
- ICT organisational management
- ICT technical management
- ICT acquisition and sales
- ICT administration
- ICT maintenance
- ICT support
- ICT training

From the list of 110 occupations, partners were asked to identify those that are accessible by a VET path. These will serve as a basis for the personalized suggestions provided to the users at the end of the questionnaire.

Step 7: Attribution of the Holland code (optional)

Once the list of occupation that are accessible by a VET paths in the most partner countries was extracted, an equivalent job description was found in the O*NET job classification (https://www.onetonline.org/) for these occupations. This classification provides a Holland code for every job description included in the database. In some cases where no clear equivalent for the occupation could be found in the the O*NET database, the Holland code was extracted analogically from the closest occupation.

This step allows for a more rigorous approach in the elaboration of the personal recommendations after the questionnaire. However, it is not necessary to go through the whole process of matching occupations with their Holland code from the O*NET database – other, more intuitive methods can be used for the elaboration of the personalized suggestions, e.g. using the expertise of qualified career guidance counsellors or experts from the given economic sector.

ICT system analyst	I	C	R
User experience analyst	I	R	S
System configurator	I	R	C
Database designer	I	C	E
Digital games designer	A	E	R

Digital media designer	A	R	S
ICT network architect	I	R	E
ICT system architect	I	R	E
Software architect	I	C	R
User interface designer	I	A	S
Technical communicator	I	S	R
Database developer	I	C	E
Database integrator	I	C	E
Embedded systems software developer	I	C	R
ICT application developer	I	C	T
ICT network engineer	I	R	C
ICT system developer	I	C	E
Software developer	I	C	R
User interface developer	I	R	A
Web developer	C	I	A
Application software tester	C	R	I
Digital games tester	C	R	I
ICT accessibility tester	C	R	I
Software tester	C	R	I
ICT product manager	E	C	I
Web content manager	I	E	S
ICT operations manager	E	C	I
Software manager	E	C	I
Data centre operator	R	C	I
ICT network administrator	I	R	C
ICT security administrator	C	R	I
ICT system administrator	I	R	C
Telecommunications administrator	I	R	C
Webmaster	I	R	C
Broadcast technician	R	C	I
Communication infrastructure maintainer	R	C	I
Communication line technician	R	C	I
ICT network technician	R	E	C
Mobile devices technician	R	E	C
Radio technician	R	E	C
Telecommunications equipment maintainer	R	E	C
Telecommunications technician	R	E	C
ICT help desk agent	R	I	S
ICT consultant	E	C	S
ICT security consultant	E	C	S
ICT system integration consultant	E	C	S
ICT trainer	S	A	C

Step 8: Classification of learning outcomes and occupations by RIASEC codes

In the next steps, the learning outcomes of the VET sectors in the countries were analysed and sorted based on the RIASEC code. This steps requires a cooperation with career guidance experts with a good knowledge of the Holland's theory. 10 learning outcomes were identified for every Holland type:

LEARNING OUTCOMES
Realistic
1. configure a system according to a specific demand 2. install network management software 3. measure electronic circuits 4. manage and administer company's computer network 5. service computer hardware 6. assemble computers from different components 7. Connect, operate and configure PCs and their peripherals 8. Install power supplies and test electrical safety measures 9. Install networks and wireless transmission systems 10. Carry out maintenance work to information technology and telecommunications equipment and systems
Investigative
1. realize a diagnostic of a PC 2. use measuring devices and methods and process and correctly interpret measured values 3. design control systems 4. create and tune a program in a concrete PC language 5. elaborate complex solutions to technical problems while taking into account the economic constrains of the company 6. analyse data using simple data models 7. use electrical charts and manufacturing drawings, including graphical documentation, in constructing, designing, and diagnosing 8. solve basic electro-technical circuits and calculate their parameters when using discrete and integrated elements; 9. elaborate a conceptual structure of a database 10. conceive and realize statistical analysis
Artistic
1. design a website using common publishing systems 2. conceive interactive multimedia applications 3. create presentation and advertising materials 4. edit photos using specialized software 5. create web pages and multimedia documents for the Internet network; 6. process and present graphic information 7. use 2D and 3D conception software 8. elaborate a graphic chart / graphic language of a website / company 9. use creativity in developing ICT solutions / products 10. create 2D or 3D animations
Social

1. coordinate a service of maintenance of hardware with a team 2. collaborate closely with a project team 3. communicate with the client in order to clarify the technical specification 4. counsel customers in the choice of software and hardware 5. provide support to employees with hardware or software related problems 6. elaborate user manual adapted to the level of expertise of the target group 7. define common problems and troubleshooting solutions with a focus group of users/customers 8. present information to final users / clients concerning technical problems 9. train users for the usage of software solutions or different devices 10. counsel clients / troubleshoot problems on via telephone
Enterprising
1. propose a technical solution and parameters of technical solutions to a company management 2. manage, supervise and coordinate an ICT project or a project team 3. present the technical solution to clients 4. prepare quotes, provide information on financing options and conclude contracts 5. undertake business negotiations in the area of computer technology 6. work as a sales/purchasing agent for IT technology 7. issue orders and procure information technology and telecommunications systems 8. negotiate the technical specifications / price with clients 9. promote ICT products and solutions 10. analyse customer requirements
Conventional
1. Assure the maintenance of database using table or database software 2. test applications, processes or batch tasks 3. plan the maintenance and service of hardware 4. assure backup of data 5. apply legal standards connected with the use of software and with handling information 6. aggregate large data 7. prepare a time plan of a hardware/software project 8. create a knowledge base 9. prepare business letters in standard formats 10. elaborate tender specifications for an external provider

Step 9: Transforming items into a questionnaire

The learning outcomes sorted in the previous step will serve as a basis for the development of an online questionnaire that will help the drop-out identify their dominant RIASEC types. The questionnaire is presented in electronic form to the participant with an appropriate introduction:

„The following tool can help you make sense of the knowledge, skills and competences developed during your university study and help you decide about your further educational path. Your use of this assessment should be for educational purposes (learning about Holland's theory). It should not be used as psychological advice and is not a replacement for a counsellor. Additionally, your answers may be anonymously stored and used for research.

You will be presented with 60 activities that you will have to rate by how much you would enjoy performing each on a scale (1) dislike (2) slightly dislike (3) neither like not dislike (4) slightly enjoy (5) enjoy. The test will take most ten to fifteen minutes to complete."

In the questionnaire, the items are presented one by one (in randomized or fixed order) and the user evaluates them on the Likert scale (from 1 to 5) based on his or her personal preferences:

Item	Dislike		Neutral		Enjoy
Configure a system according to a specific demand					
Realize a diagnostic of a PC					
Design a website using common publishing systems					
Coordinate a service of maintenance of a hardware with a team					
Propose a technical solution to a company					
Invoice for provided services					

This presentation has following advantages:

- more granular evaluation of the proposed items
- easier administration that requires less cognitive effort from the user

Step 10: Development of the personalized suggestions (questionnaire results)

The final score of the questionnaire is calculated as a sum of replies for the items that belong to every factor (1 to 5 points per item). This allows for a ranking of the 6 types. At the end of the questionnaire the user is presented with the description of the types and a weighted average of the responses (percentage of the correspondence with the six types calculated). Alternatively, the user is presented only with three types that gained the highest scores.

The objective is to give user open ended suggestions of different possibilities to reengage in formal learning and motivate him to explore them further. We propose the following structure of the descriptors:

- General description: describes the main characteristics of the Holland professional type including interests, personal traits and problem solving style
- Activities in IT: describes types of activities in the IT sector that can be suitable for the given professional type
- Options ideas: lists occupations in the IT sector that are suitable for the given professional type, based on the O*NET job classification. Given the purpose of the ProNET project, only occupations accessible through the VET system are available here. Also, this part should be country-specific and provide up-to-date links to VET programs and schools.
  In countries, where the offer of higher VET training programs is not large enough to propose personalized suggestions based on three types, or where transitions from university to VET are not feasible for other reasons, this list of suggestions can include non-formal training courses in the IT field. Many different certificates exist that improve the employability and career prospects of drop-outs in ICT field (e.g. CISCO, Microsoft Partners, Autodesk, ORACLE DB). This will be elaborated by the project partners and classified by the partner responsible for the guidelines into 6 professional types.

	General description	Activities in IT	Options ideas
Realistic	You like to work with your hands, focus on things in the physical world and use physical skills. You like to explore places and things and frequently have a desire for adventure. You like to repair and make things with your hands, tools, and machines. Outdoor work is often preferred. Characteristics: stable, assertive, physical strength, practical Problem Solving: You prefer problems that are concrete rather than abstract. You search for practical solutions that can be acted out.	Installing, setting-up and maintaining hardware or software	- Data centre operator - Broadcast technician - Communication infrastructure maintainer - Communication line technician - ICT network technician - Mobile devices technician - Radio technician - Telecommunications equipment maintainer - Telecommunications technician - ICT help desk agent - ICT technician - ICT network engineer

Investigative	You tend to focus on ideas. You enjoy collecting and analyzing data and information. You are curious and tend to be creative and original. Investigative types are task oriented, and tend to prefer loosely structured situations with minimal rules or regulations, although some structure contributes to your creativity. Characteristics: Reserved, independent, analytical, logical Problem Solving: You prefer to think through, rather than act out problems.	Designing software solutions, conceiving IT systems and projects. Collecting and analysing data.	- User experience analyst - ICT system analyst - System configurator - Database designer - ICT network architect - ICT system architect - Software architect - User interface designer - ICT network administrator - ICT security administrator - ICT system administrator - Telecommunications administrator
Artistic	You are creative and you focus on self-expression through various forms/mediums: images, materials, music, words, movement, as well as systems and programs. You are able to see possibilities in various settings and are not afraid to experiment with your ideas. You like variety and tend to feel cramped in structured situations. Characteristics: Intuitive, creative, expressive, unconventional Problem Solving: You deal with problems in intuitive, expressive, and independent ways. You tend to be adverse to rules.	Designing graphical products, user interfaces. Creating and communicating content.	- Digital games designer - Digital media designer - User interface designer - User interface developer - Web developer - ICT trainer
Social	You are concerned with people and their welfare. Social types make friends easily and tend to have well developed communication skills. You enjoy working with groups or individuals, using empathy and an ability to identify and solve problems, and tend to be high achievers and good leaders. Characteristics: Humanistic, verbal, interpersonal, responsible Problem Solving: You deal with problems through feelings. You have a flexible approach to problems.	Supporting customers, training people in IT. Working in IT projects that require cooperation.	- ICT help desk agent - User experience analyst - Digital media designer - User interface designer - Technical communicator - ICT trainer
Enterprising	You are goal-oriented and want to see results. You work with and through people, providing leadership and delegating responsibilities for organizational and/or financial gain. These	Selling / buying IT products and solutions. Analysing needs and closing contracts. Managing	- ICT product manager - ICT operations manager - Software manager - ICT consultant - ICT security consultant

	people tend to function with a high degree of energy. You prefer business settings, and often want social events to have a purpose beyond socializing. Characteristics: Persuasive, confident, demonstrate leadership, interest in power/status Problem Solving: You attack problems with leadership skills. You are a decision maker.	IT projects.	- ICT system integration consultant - ICT trainer
Conventional	You are oriented to completing tasks initiated by others. You pay attention to detail, and prefer to work with data, particularly in the numerical, statistical, and record-keeping realm. You have a high sense of responsibility, follow the rules, and want to know precisely what is expected of them. Characteristics: Conscientious, efficient, concern for rules and regulation, orderly Problem Solving: You prefer clearly defined, practical problems. You prefer to solve problems by applying rules.	Testing applications. Controlling processes and maintaining infrastructure. Writing technical documentation.	- Web developer - Application software tester - Digital games tester - ICT accessibility tester - Software tester

Using the online tool in a guidance process

The online tool cannot substitute a personalized guidance and counselling process. Career guidance provision and drop-out support systems vary across countries. In these guidelines we propose an example of how the online tool can be integrated into a wider career guidance process with the drop-outs.

Step	Form and content	Outcomes
1. **Welcoming and initial analysis**	Form: Individual meeting Duration: 30 minutes Content: - Welcoming the participant - Analysis of the current situation - Discussion about the ideas of the future - Contracting of the goals of the common work and of the next steps - Presentation of the online tool	Definition of the demand and a contract between the counsellor and the drop-out
2. **Online tool: Portfolio**	Form: self-service Duration: 1 - 3 hours	Documentation of the learning outcomes
3. **Online tool: Questionnaire**	Form: self-service Duration: 20 minutes	Positioning and identification of hypothesis of professional orientation
4. **Support, verification and action-planning**	Form: Individual meeting(s) Duration: on demand Content: - Assistance with the usage of the portfolio - Analysis of the results of the questionnaire - Joint analysis of the personalized suggestions - Mediating contacts with professionals or companies in the targeted occupation - Exploration of regional training opportunities - Preparing of a personal action plan with concrete steps for the implementation	Personalized action plan for re-entering formal or non-formal education