THE QUEST FOR THE COMPETENCES OF A FUTURE-ORIENTED INDIVIDUAL: RESEARCH METHODOLOGY AND FINDINGS

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Statement of originality:

This deliverable contains original unpublished work, except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Disclaimer

Note:

For anyone interested in the detailed outputs of the WP1 package, such as: a specific phase of the research process, or detailed findings, the project consortium can provide the additional information required. Please contact us at: info@futureoriented.eu.

Table of Contents

ABOUT THE PROJECT

The main aim of the report is to present the results of Work Package 1 within the **ERASMUS+ project: "Becoming Future-Oriented Entrepreneurs in universities and companies – beFORE",** which is co-funded under the Knowledge Alliance scheme.

beFORE takes on the challenge **to transform university entrepreneurship education, company training and business practice**. The project brings together academic, research, VET and business partners**, who anticipate to develop and release the original educational offer**, which would nurture Futures Literate Individuals with improved capacity for analysing and dealing with the unknown future challenges when pursuing a professional career, managing an organisation or developing innovations in the present.

The project is a fruit of cooperation among 10 institutions coming from four countries, namely Poland, Germany, Italy and Spain. Project partners and associated networks are presented in Figure 1.

1. **ITeE-PIB – Institute for Sustainable Technologies – National Research Institute**, Radom (Poland)
2. **Białystok University of Technology**, Bialystok (Poland)
3. **University of Pisa**, Pisa (Italy)
4. **Mondragon University – Faculty of Business Studies**, San Sebastian (Spain)
5. **Freie University Berlin – Institut Futur**, Berlin (Germany)
6. **ValueDo**, Firenze (Italy)
7. **4CF**, Warsaw (Poland)
8. **Erre Quadro**, Pisa (Italy)
9. **Prospektiker**, San Sebastian (Spain)
10. **Aveniture**, Freinsheim (Germany)

Figure 1. The project partners and associated networks
Source: ITeE-PIB's study.

The project is coordinated by the Institute for Sustainable Technologies – National Research Institute from Radom (Poland). The partnership promotes cooperation among research institutions (project coordinator) universities (Bialystok University of Technology (Poland) Freie University of Berlin (Germany), Mondragon University (Spain)), companies (Valuedo (Italy), 4CF (Poland), Erre Quadro (Italy), Prospektiker (Spain), Aveniture (Germany) and associated networks such as **Foresight Europe Network**, **ISPIM**, **EPPM**, **Netzwerk Zukunftsforschung**.

WHY HAS THE CONSORTIUM DECIDED TO UNDERTAKE THIS PROJECT?

The project recognizes the **needs**, problems and challenges of systemic and individual nature concerning university education and business practice and related to **futures literacy** (also known as

"**foresight**"), which characterise **project beneficiaries: university teachers, academic researchers, company training providers, students and managers.**

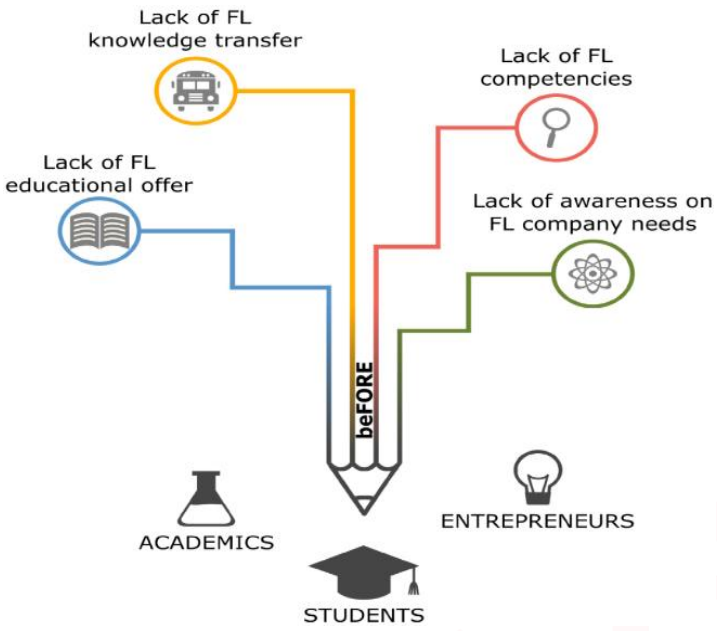


Figure 2. Rationales for the project
Source: Authors' study.

(Why 1) Higher entrepreneurial university education slowly update their traditional curricula giving limited attention to **(Need 1)** monitoring what knowledge and skills are in demand on the labour market and thus failing to **(Need 2)** address competences related to systematic analysis of long term interdisciplinary trends, discontinuities and global challenges (i.e. societal-ecological-economic-technological-political), and **(Need 3)** make the learners able to use this knowledge in day-to-day and strategic decision making when it comes to innovation or company management.

(Why 2) Futures studies university education is not widely and evenly distributed, it is fragmented all over the world, in Europe or on national levels. Where futures studies is included in the curricula, it usually stands out offering **(Why 3)** separate degrees in Futures Studies, where **(Why 4)** too much attention is given into developing scientific methods aimed to provide "better" evidence of the future. Whereas, little attention is given to the **(Need 4)** intensification of the knowledge exchange between futures studies and other academic communities, to show how **(Need 5)** to teach better ways to cope with the uncertainty and thus **(Need 6)** increase the impact of foresight on innovation or company management.

(Why 5) Entrepreneurial skills of university students are limited to financial, economic, and business literacy and in addition to interpersonal and self-directional skills. Whereas, **(Need 7)** the students need knowledge about models, methods and tools for analysing and dealing with the future challenges in the present and **(Need 8)** practical skills for developing business ideas, which aim at discovering new markets, products or services.

(Why 6) Companies regard human-centered, organisational innovations (eg foresight) **as time-consuming and less worthy** than product and process innovations that are believed to quickly bring profit. But the two types of innovations are intertwined and required for success of a company especially in the times of information overload, accelerated change and genuine uncertainties in the business environment. Therefore, **(Need 9)** company managers require knowledge and skills to find, filter, interpret, and **(Need 10)** use futures data in business practice.

The project aims to overcome shortcomings, as in Figure 2, by developing and releasing the educational offer that would unite practical experience of foresight training providers and academic teaching expertise in entrepreneurship with the needs of students and entrepreneurs.

EXPECTED PROJECT OUTPUTS

The project will contribute to the development of e-learning based educational solutions, in order to facilitate achieving a desired foresight awareness among project beneficiaries, namely: entrepreneurs, students and educators.

The specific needs of all three target groups will be analysed in a pan-European survey and effectively addressed in the educational offer composed of the core e-learning Futures Literacy course and the three auxiliary Futures Literacy e-learning courses for students, entrepreneurs and academics, respectively.

The project outputs will be instrumental in acquiring knowledge and skills: (i) by university teachers and company training providers allowing them to educate Futures Literate Individuals (ii) by entrepreneurs enabling them to take advantage of market and technological opportunities leading to innovations (iii) by students helping them to capture and develop business ideas.

WP1 METHODOLOGY

The methodology of the whole project consists of ten Work Packages (WPs). The goal of the WP1 presented in this report was to establish a framework of reference for the development of the e-learning courses. As noted in the project proposal, the list of competences identified in WP1 package will be **a starting point** to formulate needs analysis questionnaires in WP2 package. Consequently, the online educational offer, which will be developed in WP3 package and WP4 package will address the so identified competences in WP1 package and validated in WP2 package (Figure 3).

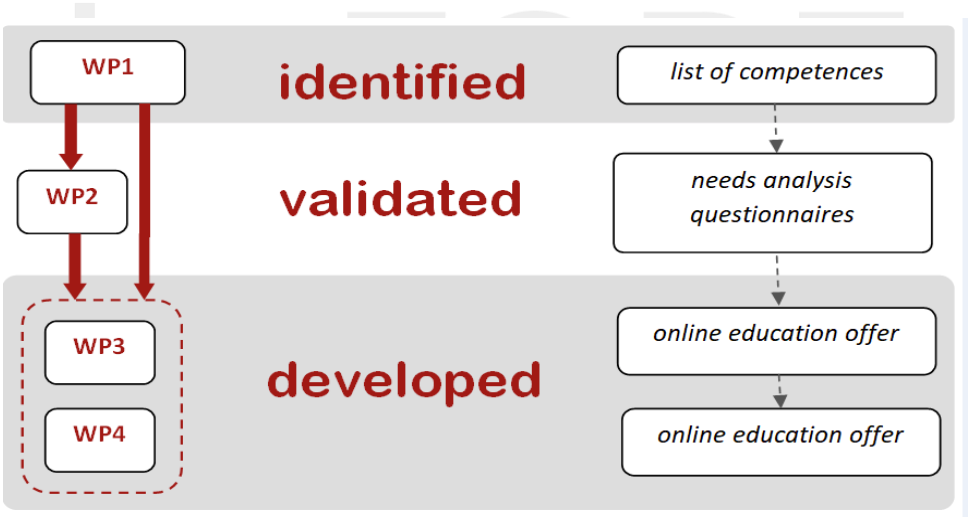


Figure 3. How WP1 links to other WPs

Source: Authors' study.

The methodology for Work Package number 1 consisted of three logically connected research tasks, namely: 1) cross-literature review, 2) collection and identification of best corporate and educational practices, 3) consistent framework for an online database (see Figure 4).

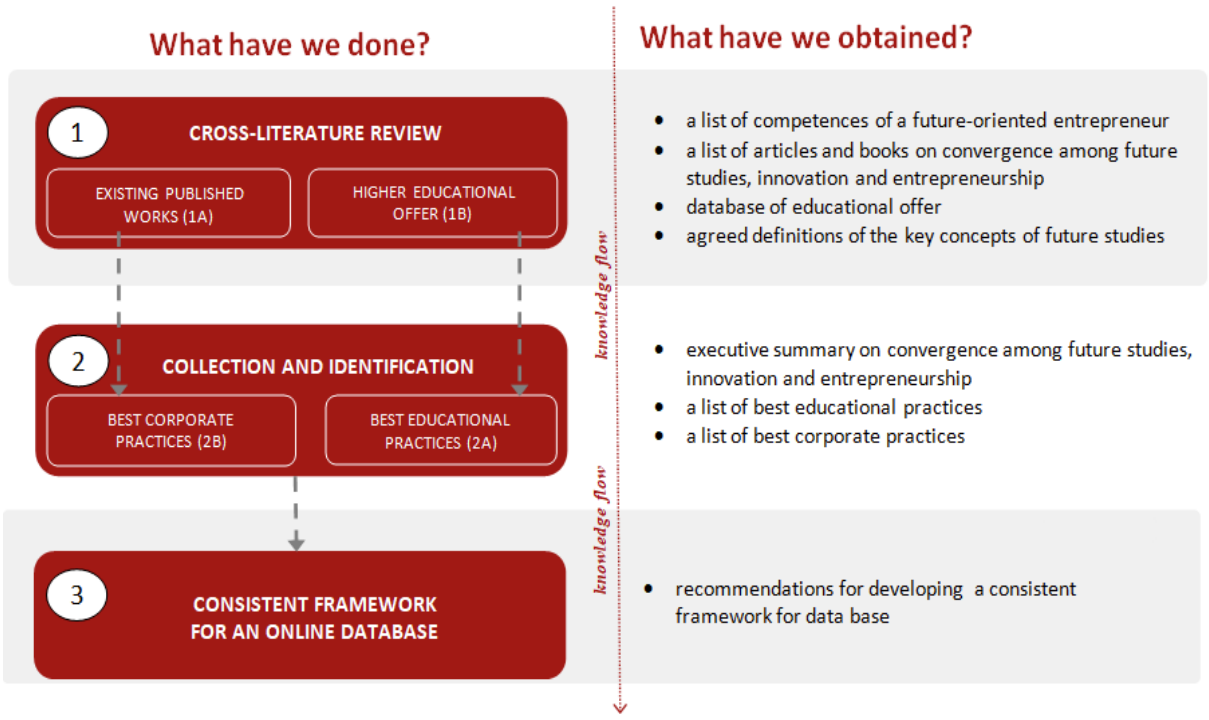


Figure 4. A methodology for Work Package 1
Source: Authors' study.

CROSS-LITERATURE REVIEW:

The aim of the cross-literature review was to detect the convergence among futures studies, entrepreneurship and innovation by the identification of a list of competences (described as: knowledge, skills and social competences) which should characterize a future-oriented entrepreneur. This aim was achieved by the analysis of both 1A) state of the art in the existing published books and works located in accessible scientific databases such as SCOPUS, Web of Science, Elsevier, Emerald etc. and 1B) higher education offer. There were also investigated courses, lessons, workshops etc. from outside of the higher education offer. Each partner involved in the task (universities) was free to select at least ten articles/books for the global literature review and ten articles for domestic literature review. The partners were also free to add any relevant articles/books on the subject matter. The examples of the templates completed by the project partners are presented in Appendix 1.

COLLECTION AND IDENTIFICATION:

The aim of this research task was to collect and characterize 2A) existing best educational and 2B) corporate foresight and use cases following criteria of indicating best practices such as:

- universality of the practice – easy access to documentation on the scope of the practice, especially clarity and accessibility of the description of the adopted methodological procedure;
- repeatability – a possibility of applying a given practice or its modification again in another 2A) educational offer or 2b) different strategic foresight context, regardless of the specificity of the region or sector
- the practice has assumed a character of methodical procedure;

- the practice constitutes well established knowledge or a novel solution compared to other popularly used solutions.

Existing best educational practices were identified by each partner envisaged in the methodology of WP1 on the basis of criteria mentioned above and a detailed analysis of the database of higher education offer regrading convergence among future studies, entrepreneurship and innovation (1B). The exemplary template concerning identified business practices and completed by the project partners is presented in Appendix 2. The partnership prepared the templates for all the stages of the methodology which were completed by the project partners.

CONSISTENT FRAMEWORK FOR AN ONLINE DATABASE:

On the basis of the critical analysis of the information gathered during the first and second research tasks, the aim of this research task was to provide recommendations for developing a consistent framework for an online database embracing such information as top ranked articles on convergence among futures studies, entrepreneurship and innovation, the list of the identified foresight researchers writing on the subject matter, the list of core foresight and innovation/entrepreneurship competences in relation to knowledge, skills and social competences, educational and business entities conducting strategic foresight in countries of the analysis, the scope of foresight research and key foresight competences in the identified companies. Moreover, it was assumed that the database would provide insights into the best educational offer regarding convergence of future studies and other disciplines mentioned above.

Moreover, the partners were also asked to prepare national reports on their analyses. The data collection process required a series of activities from the partners involved in this task. Each of them, apart from filling in the templates, was asked to prepare a summary of the conducted work, containing the following elements:

- overview of global and domestic literature analysis,
- overview of syllabuses analysis,
- overview of courses analysis,
- overview of business templates analysis,
- general remarks or comments about the content of the analysis.

All in all, out of 193 sources, (global and domestic literature review: 71, syllabuses: 53, foresight courses: 17, business foresight practices: 52) there were identified the extensive set of competences consisting of 1626 items.

The further works on the qualitative analysis of the identified competences are presented in the next section. The juxtaposition of the data sources is presented in Figure 5. The geographical distribution of higher education offer as well as the distribution of business foresight practices (Appendix 4) are presented in Appendices 3 and 4.

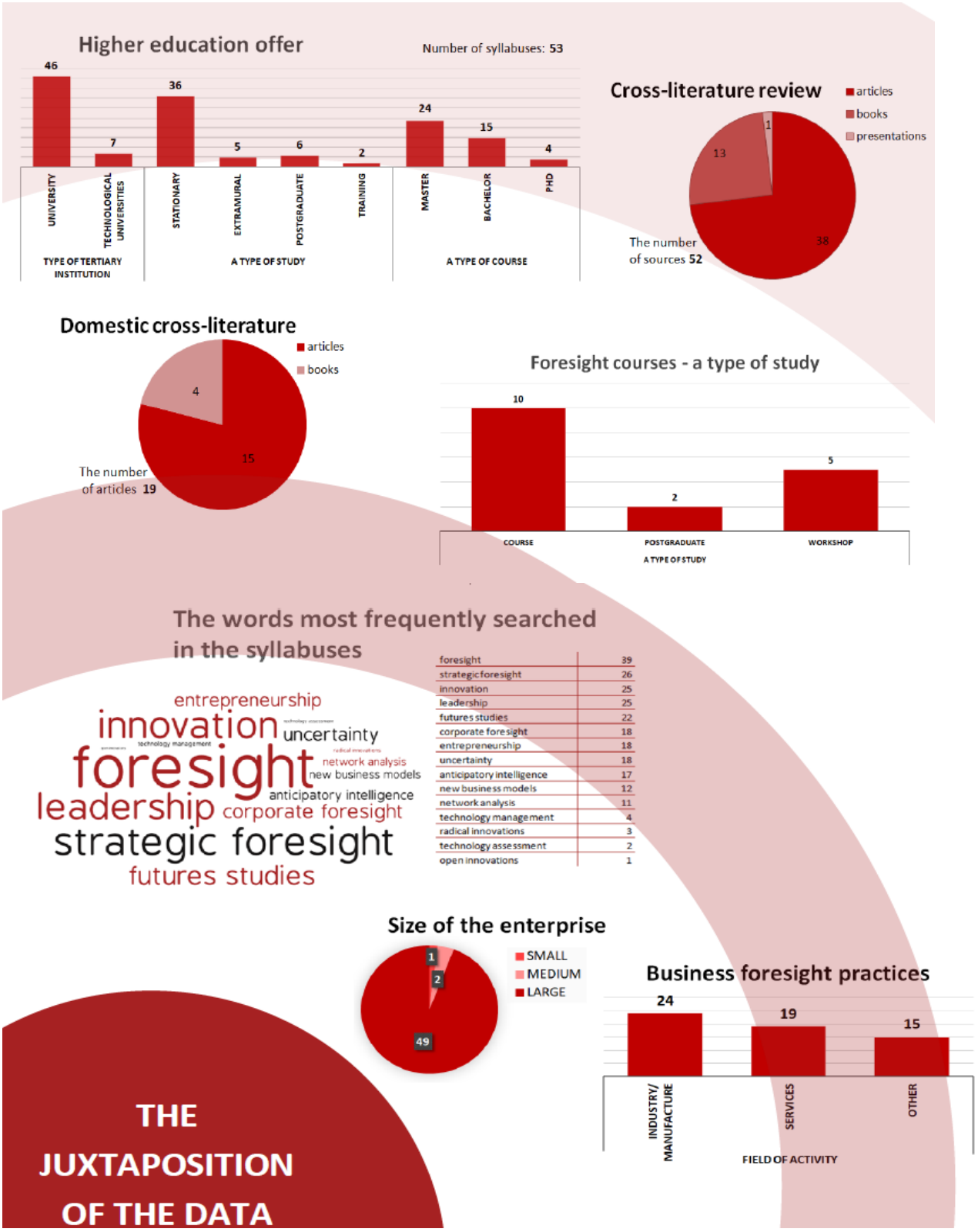


Figure 5. Juxtaposition of the data sources
Source: Authors' study.

CREATING THE SET OF COMPETENCES OF FUTURE-ORIENTED INDIVIDUALS

The set consisting of 1626 competences was then the subject for further qualitative analysis. The whole process of the reducing the number of competences is presented in Figure 6.

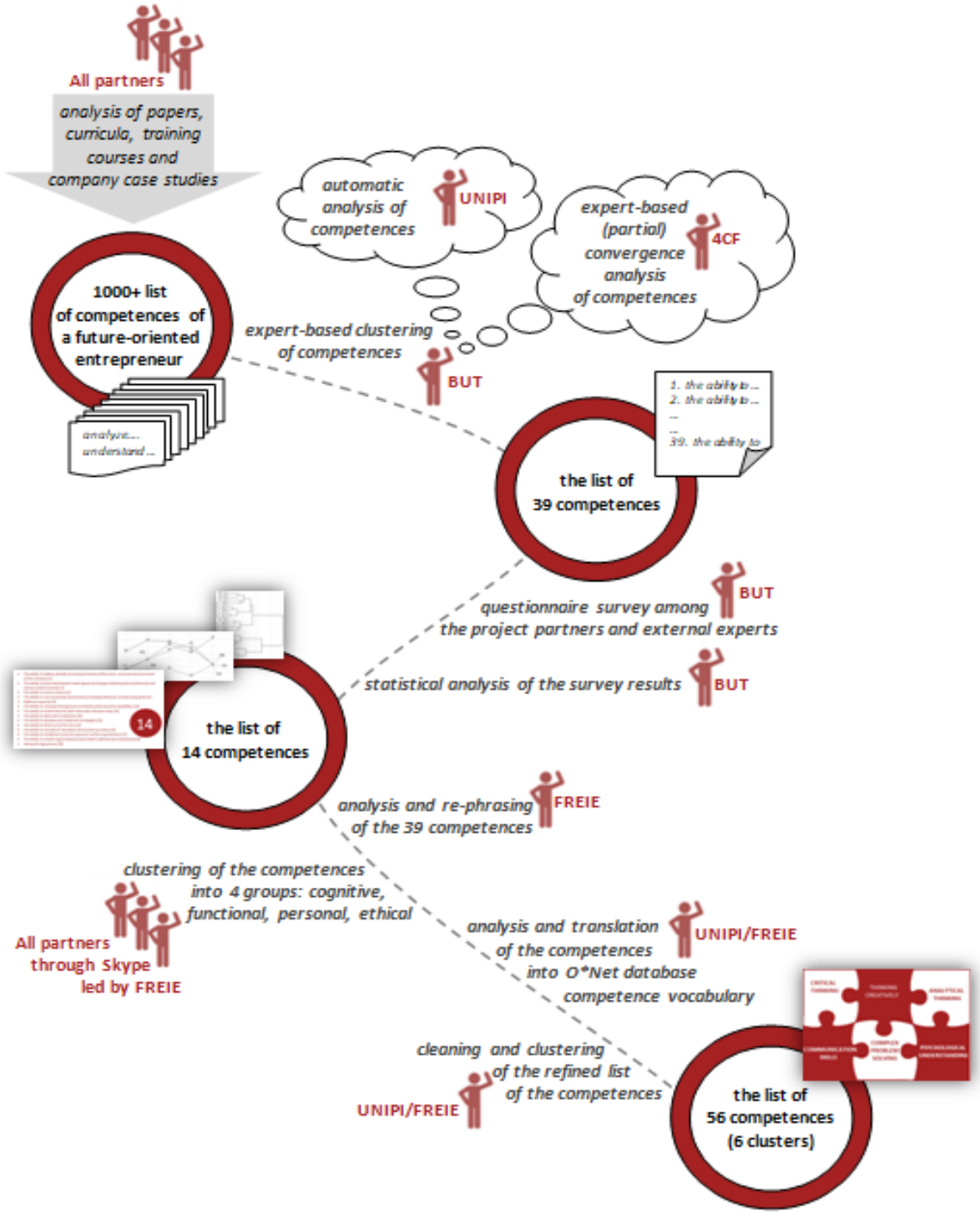


Figure 6. How we managed to reduce the number of competences from 1626 items to 6 clusters
Source: Authors' study.

As the set of competences was very extensive, two stages of clustering were proposed:

STAGE I – preliminary – manifested in the initial overview of the 1626 competences and assigning them to the one of the 12 working spheres such as: (*INSIGHT, FRAMING, CREATIVITY, PERSONAL, LEADERSHIP, IMPLEMENTING, STRATEGY, INNOVATION, VISIONING, THEORY&METHODS, GENERAL KNOWLEDGE, NOWHERE ELSE*). The names of the clusters were retrieved on the basis on the experts intuition as well as foresight models and stages already existing in the literature (such as Foresight Competency Model, APF 2016[1]; B. Habegger[2]; I. Miles and R. Popper[3]; A. Magruk[4]). The identification of the working spheres helped the researchers to capture the whole range of competences and then further group them within the working groups.

STAGE II – basic – manifested in the detailed analysis of each of the competences and the final assigning them to the thematic area. The same competences (and the similar ones) were grouped under subclusters. If there appeared some of the competences that were not clear in meaning or the competences not necessarily linked with the thematic scope of the course, they were assigned to the nowhere else cluster. As the scope of the project is more on the competences of an entrepreneur stemming from knowledge and skills area, "personal competences" and "nowhere else" cluster of the competences were excluded from the analysis. After the rejection of "personal competences" and "general knowledge", the group comprised 50 working clusters of the competences.

Considering the similarity of the expressions appearing in the competences, UNIPI team run competence automatic extraction, cleaning and clustering of the selected competences.

In the next stage of the research process, it was agreed to include to the methodology additional data mining analysis taking into account all of the gathered competences (1622 competences) As a result of the analysis, a list of expressions was achieved, taking into account objects, verbs, adjectives and adverbs. The analysis was accompanied by the frequency analysis of the "competences chunks" mentioned above.

OBSERVATIONS AND COMMENTS

*It is important to mention, that during the works on data analyses, two interesting research themes emerged: **the first one** – indicating the possibility of competences networks preparation on the basis of object/verb/adv & adj analysis depicting not only the frequency of the given expressions, but also their coexistence in the competences and the **second one** – indicating the possibility of the most frequent expressions use for new competences building.*

Taking into account the chance to carry out preliminary assessment of the competences among external experts (specialists in futures studies) participating in Spring 2017 FEN meeting in Turku following the conference FUTURES OF A COMPLEX WORLD, (13-14 June 2017 – Turku, Finland) and Vienna ISPIM conference, it was agreed that BUT team would prepare a questionnaire enabling the preliminary assessment of the competences among experts.

[1] Association of Professional Futurists, *Foresight Competency Model – 1.1*, http://apf.org/wordpress/wp-content/uploads/APF-Foresight-competency-model-1.1-1.pdf, August 2016

[2] Habegger B., *Strategic foresight in public policy: Reviewing the experiences of the UK*, Singapore, and the Netherlands, "Futures" 2010, Vol. 42, pp. 49-58

[3] Popper R., *Foresight methodology*, [in:] The handbook of technology foresight: concepts and practice L. Georghiou, C. J. Harper, M. Keenan, I. Miles, R. Popper (eds.), Publisher: Edward Elgar, Cornwall 2008; Popper R., *How are foresight methods selected*?, "Foresight" 2008, Vol. 10, No. 6, pp. 62-89

[44] Magruk, A. (2014). The most important stages of innovative management of the future in the foresight approach. Problemy Eksploatacji.

Considering the fact, that project's partners indicated during M2 meeting in Białystok that the competences needed further clustering, a further analysis of the initial list of 50 competences was carried out by BUT team. The initial list of the clusters was juxtaposed with 1) the results of data mining abject/verb/adv&adj (checking if the most frequently appearing phrases have been taken into consideration into emerging list of the competences), 2) results of the literature review suggested by ISPIM partners and 3) basic competences (also evaluated) in Mondragon Team Academy. Finally, (for the sake of juxtaposition) the following existing published works (suggested by ISPIM partners) were also taken into consideration:

- Spencer, L. and Spencer, S. (1993), Competence at Work: Model for Superior Performance, Wiley, New York, NY.
- Boyatzis, R.E. (1982), The Competent Manager: A Model for Effective Performance. Wiley, New York.
- Bird, B. (1995), Towards a theory of entrepreneurial competency. Advances in Entrepreneurship, Firm Emergence and Growth. 2, 51-72.
- Chandler, G.N. and Jansen, E. (1992), The founder's self-assessed competence and venture performance. Journal of Business Venturing. 7(3), 223-236.

As a result of this analysis, a pilot list of 39 competences was created (Appendix 5), that was then the subject to further assessment. Three groups of experts assessed the set of 39 competences (Table 1). With the reference to each group of experts, a form of assessment and a tool was specified as well as the achieved results.

Table 1. Groups of experts carrying out the preliminary assessment

EXPERTS	WHERE	THE FORM OF ASSESSEMENT	RESULTS
GROUP 1: external	Spring 2017 FEN meeting in Turku following conference FUTURES OF A COMPLEX WORLD, (13-14 June 2017 – Turku, Finland)	A survey in the paper form	8 questionnaires were returned
GROUP 2: external	XXVIII ISPIM Innovation Conference *Composing the Innovation Sympony* (18-21 June 2017 – Vienna, Austria)	Futures literacy workshop*) led by: A. Sacio-Szymańska (ITEE), A. Kononiuk (BUT), K. Nosarzewski (4CF) and Erica Bol (Teach the Future)	The ranking of the importance of the competences for a future – oriented manager/entrepreneur a list of the competences posited by the *Furures literacy* workshop participants
GROUP 3: internal	A questionnaire sent to beFORE project partners	A questionnaire in the electronic form available under the following address: https://before.ankietka.pl/	23 questionnaires were sent back

Source: Authors' study.

In the course of the preliminary assessment of the competences, the experts evaluated not only the importance of the competences for a future- oriented manager/entrepreneur, but also (in the case of GROUP 1 and GROUP 3) they evaluated the importance of the following competences for such domains of his activity such as: insight, visioning, strategy development, innovating and leadership. The definitions of the domains are presented below:

1) **insight** – interpreting and responding to the present, assessing state of the art of factors shaping business activity;
2) **visioning** – developing a vision for the company's future (both collective and individual);
3) **strategy developement**– a plan of action designed to achieve a long-term goal, capable of being changed in response to shifting market dynamics;
4) **innovating** – applying new ideas to produce a tangible business result such as a new product, service, or process;
5) **leadership** – leading a group of people within organization, establishing a clear vision, sharing it with the employees and stakeholders, coordinating and balancing the conflicting interests of employees and stakeholders.

OBSERVATIONS AND COMMENTS

The main problem appeared in WP1 was the huge amount of the competences, their heterogeneity and granularity. Time constraints under WP1, made it impossible to carry out more in-depth analysis for such inspiring ideas as convergence analysis proposed by the 4CF partner. Hopefully, they could be used in other projects aiming at seeking convergence between different scientific fields.

For first working list of competences, that could have been taken into consideration in WP2 questionnaire, there were juxtaposed:

1. Results of the cluster analysis,
2. Results of the internal assessment of the competences importance for a future-oriented manager,
3. Results of the external assessment of the competences importance for a future-oriented manager carried out during FEN meeting and ISPIM conference,
4. Comments to the competences provided both by internal and external experts.

Taking into account all the above, the list of the following 14 competences was recommended:

- The ability to define, identify and analyze trends within micro- and macroenvironment of the company
- The ability to find and interpret weak signals of change and disruptions (wild cards and abnormal phenomena)
- The ability to work in teams
- The ability to act proactively (autonomous strategic behavior, enterprising spirit)

- Reflexive capacity
- The ability to manage change and uncertainty (also dynamic capability)
- The ability to build networks both internally and externally
- The ability to deal with complexity
- The ability to develop and implement strategies
- The ability to think out of the box
- The ability to transform new ideas into business practice
- The ability to implement scenario approach within organization
- The ability to create organizational vision (both collective and individual)
- Seeing the big picture.

After receiving the working list of 14 competences and reviewing the data mining work, the list of 39 competences was further explored. This decision was made to get a clearer frame of reference for the competences. The list of 39 items was chosen, as it gave a larger pool of possibilities. The objective was to create a set of defined competences to be used in the needs-analysis in Work-Package 2 (WP2). The procedure should result in a competence list that effectively can be addressed in the e-learning courses.

The aim of the analysis was to have a comparable granularity throughout the competences, to keep the focus on the three target groups, to not duplicate any educational offers in entrepreneurship, and keep the focus on the general educational objective of beFORE: Future Literacy.

The initial list of 39 competences was taken and re-phrased to (a) eliminate sentence structures with low-informative value by eliminating the phrases such as “ability to”. (b) Items that were multi-dimensional were separated. Based on the result, UNIPI performed a text mining activity to analyze the structure of the sentences and to verify they were comparable. Therefore, when needed, the sentences describing competences were refined again to reach such a result (c). The following list of the 39 re-phrased competences (Table 2).

Table 2. A list of the 39 re-phrased competences

The 39 competences – re-phrased	
1a.	To define trends within micro- and macro-environment of the company
1b.	To identify trends within micro- and macro-environment of the company
1c.	To analyse trends within micro- and macro-environment of the company"
2a.	To find (to seek?) weak signals of change and disruptions (wild cards and abnormal phenomena)
2b.	To interpret weak signals of change and disruptions (wild cards and abnormal phenomena)"
3.	To identify factors influencing the use of strategic foresight by companies
4.	To define measurable goals to create preferred future vision for the organization
5.	To work in teams
6.	To possess guerrilla skills to challenge assumptions
7a.	To gather data (also using IT tools)
7b.	To analyse in a process data (also using IT tools)
7c.	To interpret data (also using IT tools)
8.	To act proactively (autonomous strategic behaviour, enterprising spirit)
9.	To have reflexive capacity

10.	To develop measurement system to control innovation initiatives and strategic direction
11.	To possess coaching skills
12a.	To communicate internally
12b.	To communicate interdisciplinary
12c.	To communicate with stakeholders
13.	To manage projects
14.	To develop organizational resilience
15.	To run strategic foresight within organization
16.	To understand systemic thinking
17.	To have risk-taking capability
18.	To manage change and uncertainty (also dynamic capability)
19a.	To build networks internally
19b.	To build networks externally
20.	To deal with complexity
21.	To understand dangers of efficiency
22a.	To develop strategies
22b.	To implement strategies
23a.	To have time-organizing skills
23b.	To utilize real-time
23c.	To make optimal use of the diversities of time
23d.	To appreciate a slow life
23e.	To develop futures thinking
23f.	To develop futures consciousness
24.	To think out of the box
25.	To transform new ideas into business practice
26.	To have the capacity for design thinking
27.	To implement scenario approach within organization
28a.	To create organizational vision
28b.	To create an individual vision
28c.	To collectively develop a vision within / for an organization
29.	To identify goods or services people want
30.	To accept incompleteness of knowledge
31.	To have the capability of non-linear thinking
32.	To apply various future studies methodologies
33.	To implement selected methods of technology management (technology assessment, technology mapping, technology life cycle, prioritisation, technology audit and road-mapping)
34.	To perceive unmet consumer needs
35.	To look for products that provides real benefit
36.	To seize high-quality business opportunities
37.	To maximize results in resource allocation
38.	To see the big picture
39.	To tolerate ambiguity

Source: Authors' study.

In a next step the re-phrased competences needed to be re-grouped and put into a conclusive correlation considering the three target groups (i.e. entrepreneurs, educators, students) as well as their relationship to time i.e. future-orientation. Therefore, to establish a matrix for mapping the competences the focus was set on the **competence fields**, the relevant **target groups**, and the **time frame** of short-, medium-, and long-term future-orientation.

The matrix (Figure 7) was the foundation for a mapping workshop done via Skype together with most of the beFORE partners, which was led and moderated by FREIE. The procedure revealed that there are competences, which may be significant for general education in entrepreneurship or are only

relevant in short-term orientation but have **no effect on medium- /long-term futures**. Those items were eliminated from the above list (counting 55 items) resulting in a group of 25 competences (34 items). As an example, the item "29. To identify goods or services people want" dropped out of the list, as it mainly focuses on short-term futures and is taught in business i.e. entrepreneurial studies. Whereas, the partnership agreed to keep "02b. To interpret weak signals of change and disruptions" having an effect on long-term futures and being an important aspect in the field of Futures Studies and foresight.

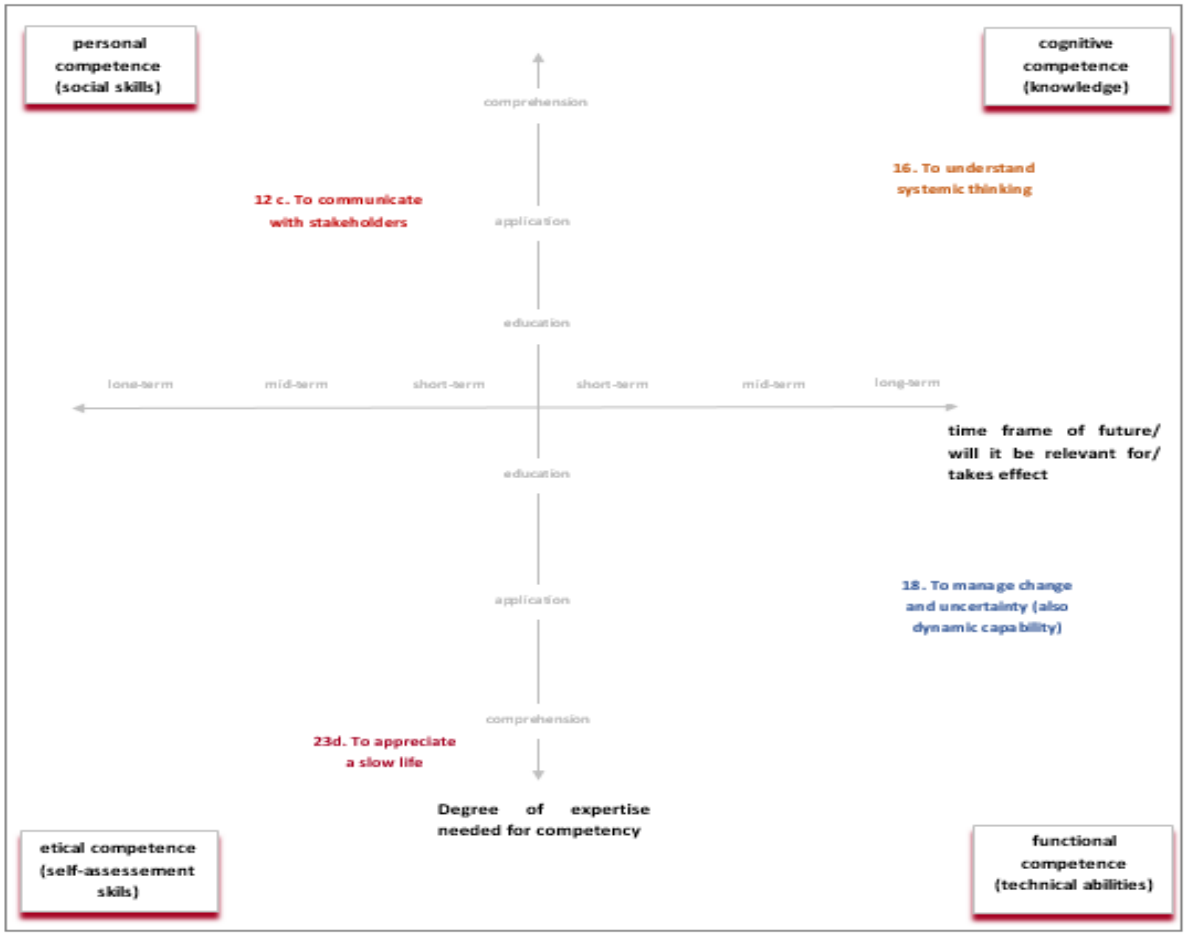


Figure 7. A matrix for competence evaluation

Source: Authors' study.

Starting from the updated list created in the mapping activity, UNIPI worked to match those complex sentences with the competences identified in the O*NET database. Thanks to this, a list of elements was selected to decompose the 39 competences in items that were specific enough to be considered as basic skills and to be taken into consideration according to a common level of granularity.

The final list of competences has been created by taking the list of correspondent O*NET and by removing all the duplicates. The final result was a list of 57 competences were further assessed to make them comparable to each other.

Finally, the clustering, sorting, and filtering of the list based on the O*NET Database definitions were done by comparing the result to a combination of Futures Literacy and APF competency foresight model, distinguishing meta- and micro-competences, and relating the resulting list to the process

used in the Futures Wheel method. In this procedure, competences were extracted by WP2 leader, ITeE, the fellows: BUT and FREIE, and in agreement with all partners. Resulting in the identification of 12 relevant competences (Table 3) in Futures Literacy. These will be examined further by respondents in the needs analysis survey of Work Package 2 (WP2).

Table 3. Final list of 12 competences used in WP2 questionnaire

No	Competence	Definition
1	**Adaptability/Flexibility**	The ability of people to learn, think, act, and work differently in complex, uncertain and changeable circumstances.
2	**Analysing data or information**	Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.
3	**Critical thinking**	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
4	**Developing objectives and strategies**	Establishing long-range objectives and specifying the strategies and actions to achieve them.
5	**Inductive reasoning**	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
6	**Influencing others**	Convincing others to change their minds or actions.
7	**Interpreting the meaning of information to others**	Communicating with others to translate or explain what information means and how it can be used.
8	**Making decisions and solving problems**	Analysing information and evaluating results to choose the best solution and solve problems.
9	**Problem sensitivity**	The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
10	**Reflexive capacity**	Thinking through how your professional and personal values impact your working activities. With reference to those frames, being able to explain your own as well as the others' behaviour.
11	**Systems analysis**	Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
12	**Thinking creatively**	Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.

Source: Authors' study.

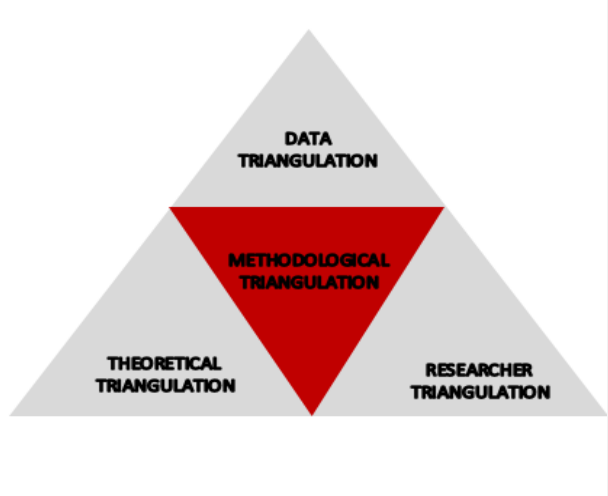
RECOMMENDATIONS, INTERESTING FACTS AND GENERAL CONCLUSIONS

WP1 aimed at establishing a framework of reference for the development of e-learning courses directed towards university teachers, entrepreneurs and students coming from the countries of partnership, namely: Germany, Italy, Spain and Poland.

Such target was achieved through:

- cross-literature review to detect the convergence among disciplines (especially futures studies, entrepreneurship, innovation);
- collection and identification of main characteristics of existing best educational and corporate practices and use cases, that introduce or are based on Futures Literacy for education and training.

The methodology of the research was based on the triangulation concept posited by Denzin (1978). Researcher triangulation was achieved by the involvement of the experts presenting different institutions (both universities and companies) as well as the experts assessing the set of 39 competences during Spring 2017 FEN meeting in Turku following the conference "Futures of a Complex World" and "the XXVIII ISPIM Innovation Conference Composing the Innovation Symphony". Methodological triangulation was manifested by the juxtaposition of the qualitative analysis aiming at the reduction of the number of the competences with the results of data mining approach posited by UNIPI. Data triangulation consisted in taking into account both primary and sources of data (such as the competences extracted from global and domestic literature review, higher education offer, business practices as well as the brainstorming exercise run by UNIPI partner during M2 in Bialystok). Theoretical triangulation was achieved by looking at the competences through the lenses of different theoretical perspectives stemming from foresight, entrepreneurship and innovation fields.



Although global and domestic publications review presents a relatively rich approach to competences analyses for future-oriented entrepreneurs (in relation to foresight, innovation and entrepreneurship separately**) it was not possible to indicate a transversal set of competences, which would apply to a future-oriented entrepreneur.** Moreover, the selected global literature, though all in English, was written by authors being from different cultural and disciplinary backgrounds. Nevertheless, on the basis of cross-literature review performed by project partners, in the course of works, many interesting research insights were identified.

OBSERVATIONS AND COMMENTS

An added-value from the conducted literature review refers to a recommendation to consider the inclusion of Foresight Styles Assessment (FSA) approach (Dian 2009, Gary 2009, der Laan, Erwee 2012) as a communication tool in the project. FSA describes the variety of behaviors related to human ability to plan and visualize the future and react to external change. It could be used in the project as a tool that will help prospective users of the project online offer to understand the value of futures thinking and acting. By using Foresight Styles approach, project team could create so called "personas" as reliable and realistic representations of future-oriented entrepreneurs, future-oriented academics and future-oriented students, which could be easily communicated and understood by target groups of the project. Also the publication by Heinonen, S., & Ruotsalainen, J. (2012) deserves special attention. It assumes the emergence of the age of neo-entrepreneurs for which future skills and competences are more generalized and high specialization is no-longer enough. Multi-competent neo-entrepreneurs will excel in self-actualization and individual choices, added to enhanced possibilities for co-creation and collective creativity.

The review of the foresight courses enabled the authors of the report to state that generally speaking: **master, bachelor, PhD courses in the field of Futures Studies and Foresight focus on a general context of the field including its philosophical and ethical dimensions and include a strong methodological component; whereas short training offers in the field underline the overlapping of foresight with strategy of an organization, the connection between foresight and innovation and highlight a narrow set of foresight methods (most commonly: trend scanning, scenario building, strategy building and implementation; and to some extent: systems and complexity theories).** When analyzing degrees in leadership, business management, strategic planning it has been apparent that foresight theories and methods are largely absent from these, rather traditional curricula (in some cases they only incl. forecasting methods). **Also evident has been the importance of such personal traits as: creativity, imagination, welcoming change attitude, within programmes and courses in the field of leadership. The promotion of these attitudes was not a central learning objective of the majority of established educational offer in the field of foresight.**

The analysis of business practices enables to conclude that **the competences appearing to be vital for the future-oriented entrepreneur in practice are just a fraction of those listed in the existing published works or taught in the courses.** The reason for that could be the fact that some of the foresight activities are carried out by the external team of experts or internal analysts and these people – and not a manager him/herself – need specialized skills and knowledge. **A future-oriented entrepreneur, on the other hand, needs to exhibit competences of a more general type: general knowledge, open-mindedness, flexibility, persistence, reflexive capacity or readiness to question own assumption.** In this way, **there exists skills gap among the foresight-related competences taught in formal education (based on theories, methods and application of these in strategy development and implementation) and foresight-related competences sought by companies (which include the abovementioned competences as well as soft foresight skills).** This could be regarded as the prerequisite for the elaboration of the new courses in the field of foresight/future studies, and also as the opportunity of filling in the gap in traditional entrepreneurship education.

The analysis of templates prepared by project partners in the scope of: global literature review, domestic literature review, higher education offer, commercial foresight courses and business practices allowed for the consortium to identify more than one thousand six hundred competences of a future-oriented entrepreneur. The huge amount of competences, their heterogenity and a different level of granularity presented a major challenge for the researchers involved in WP1. The competences were then the subject to preliminary assessement which enabled to identify 39 competences further investigated by cluster analysis. Results of the cluster analysis, results of the internal assessment of the competences importance for a future-oriented entrepreneur carried out during FEN meeting and ISPIM conference, as well as comments about the competences provided both by internal and external experts enabled to create the initial set of 14 competences for the further analysis in the WP1. The set comprised such competences as: 1) the ability to define, identify and analyze trends within micro- and macro-environment of the company; 2) the ability to find and interpret weak signals of change and disruptions (wild cards and abnormal phenomena); 3) the ability to work in teams; 4) the ability to act proactively (autonomous strategic behavior, enterprising spirit; 5) reflexive capacity; 6) the ability to manage change and uncertainty (also dynamic capability); 7) the ability to build networks both internally and externally; 8) the ability to deal with complexity; 9) the ability to develop and implement strategies; 10) the ability to think out of the box; 11) the

ability to transform new ideas into business practice; 12) the ability to implement scenario approach within organization; 13) the ability to create organizational vision (both collective and individual); 14) seeing the big picture.

In the next stage of the research process, (after the analysis of the final set of 14 competences and reviewing the data mining work), the consortium agreed to further explore the list of 39 competences. The further works resulted in the obtaining of a list of atomic competences that as such are comparable to each other. The list comprises different levels of competences, identified as (1) meta and (2) specific (or micro).

For the further analysis, consortium agreed to focus on 12 competences:

1. **Adaptability/Flexibility**
2. **Analysing data or information**
3. **Critical thinking**
4. **Developing objectives and strategies**
5. **Inductive reasoning**
6. **Influencing others**
7. **Interpreting the meaning of information to others**
8. **Making decisions and solving problems**
9. **Problem sensitivity**
10. **Reflexive capacity**
11. **Systems analysis**
12. **Thinking creatively**

to be further explored for the Work Package 2 which aim is to map out the specific future-oriented educational/learning needs of the main target groups that is: university students, university teachers /academic researchers and entrepreneurs. Mapped out learning needs will guide the development of the online foresight courses in the following Work Package 3 and Work Package 4.

In this way, the project outputs will be instrumental in acquiring knowledge and skills: (i) by university teachers and company training providers allowing them to educate Futures Literate Individuals (ii) by entrepreneurs enabling them to take advantage of market and technological opportunities leading to innovations (iii) by students helping them to capture and develop business ideas.

The consortium hopes that the works presented within this report complements the works on the competences for a future-oriented entrepreneur presented by the Association of Professional Futurists, through Foresight Competency Model. The tools and methods applied for the competences analysis such as cluster analysis or data mining analysis may be woth considering by other researchers who have to deal with competences of various types. The extensive set of competences prepared by the consortium may be further explored by foresight reaearchers, teachers, business represeentatives and all interested in the competences of a future-oriented entepreneur.

GLOSSARY

- **FORESIGHT**

  "Foresight is a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilising joint actions. (…) It brings together key agents of change and various sources of knowledge in order to develop strategic visions and anticipatory intelligence."

  Source: *Keenan M., Miles I., (2001), A Practical Guide to Regional Foresight, Institute for Prospective Technological Studies, FOREN Network, Seville*

  "Anticipating the future. Foresight is trying to make sense of the future"

  Source: *K . Christoph Keller*

  Foresight = anticipation

  Source: *Loveridge D., (2009), Foresight. The Art and Science of Anticipating the Future, Routledge, New York–London*

- **FUTURES LITERACY**

  "Futures Literacy is the capacity to design and implement processes that make use of anticipation, generally with the purpose of trying to understand and act in a complex emergent context. The diffusion of Futures Literacy, is one way of improving the capacity of individuals and organisations to: a) detect and give meaning to discontinuity, and b) thereby becoming more capable of initiating learning processes "

  Source: *Miller R., (2015), Learning, the Future, and Complexity. An Essay on the Emergence of Futures Literacy, European Journal of Education, Volume 50, Issue 4 December 2015 Pages 513–523*

  "Futures literacy refers to practical knowledge about using the future for a given task and the methods, tools and attitude required. Futures Literacy is especially about the futures unanticipated, about the unknown, the ability to analyse, synthesise and act accordingly with step-changes and against shocks."

  Source: *K . Christoph Keller*

- **FUTURE-ORIENTED ENTREPRENEUR**

  "Is a person who has practical knowledge about using the future and is able to apply it, independently or with external help, with a good dose of creativity, innovation and risk-taking ability in career development, research development or business development. In the project, a future-oriented entrepreneur refers to university students planning business or academic career; university teachers and researchers, and owners or employees of private companies."

  Source: *A. Sacio-Szymańska*

- **FUTURES STUDIES**

  "Futures studies is the systematic study of possible, probable and preferable futures including, and of the worldviews and myths that underlie each future. Futures studies has moved from external forces influencing the future — astrology and prophecy — to structure (historical patterns of change, of the rise and fall of nations and systems) and agency (the study and creation of preferred images of the future)."

  There are four types of futures studies: (1) predictive – "in predictive futures studies, language is assumed to be neutral, that is, it does not participate in constituting the real"; (2) interpretive – "the goal is not prediction but insight. Truth is considered relative, with language and culture both intimately involved in creating the real"; (3) critical – "critical futures studies aims not at prediction or at comparison, but seeks to make the units of analysis problematic, to undefine the future. We are concerned not with population forecasts but with how the category of population has become

valorised in discourse"; (4) anticipatory action learning – "the key is to develop probable, possible and preferred estimations of the future based on the categories of stakeholders. The future is constructed through deep participation".

Sources: *Sohail Inayatullah, (2007), Questioning the Future Methods and Tools for Organizational and Societal Transformation, Tamkang University Press, Taiwan*

Sohail Inayatullah, (2013), Futures Studies: theories and methods," in Fernando Gutierrez Junquera, ed., There's a Future: Visions for a better world (Madrid, BBVA)

- **KNOWLEDGE**

'Knowledge' means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study.

Source:*GLOSSARY. RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning, http://www.eucen.eu/EQFpro/GeneralDocs/FilesFeb09/GLOSSARY.pdf*

- **INNOVATION**

"Innovation is the process of generating new ideas and applying these new ideas to produce a tangible business result such as a new product, service, or process"

Source: *Jon Martens, (2014) "Stories of innovation: roles, perspectives, and players", European Journal of Training and Development, Vol. 38 Issue: 1/2, pp.40-53, doi: 10.1108/EJTD-09-2013-0092*

"The aim of innovation is to find a future gap in the market. This means that an idea for an innovation must be future-proof."

Source: *Patrick van der Duin, Rob de Graaf, (2010) "Innovating for the future? An external assessment of the future-oriented governance of the Dutch innovation system", Foresight, Vol. 12 Issue: 5, pp.27-40, doi: 10.1108/14636681011075696*

- **INNOVATION AND ENTREPRENEURS – RELATION**

"Entrepreneurs seek opportunities, and innovations provide the instrument by which they might succeed. (…) Innovation is the specific tool of entrepreneurship, by which entrepreneurs exploit change as an opportunity for a different business or service."

Source: *Fang Zhao, (2005) "Exploring the synergy between entrepreneurship and innovation", International Journal of Entrepreneurial Behavior & Research, Vol. 11 Issue: 1, pp.25-41, doi: 10.1108/13552550510580825*

- **JOB**

A set of tasks and duties performed, or meant to be performed, by one person, including for an employer or in self-employment. Jobs are detailed descriptions of work performance and requirements that are common to a group of positions within an organisation. (ILO, 2012).

- **MANAGER**

A manager is the person who manages the operations and functions of the organization. By the term 'manager' we mean a person who gets the things done through his subordinates, with the aim of accomplishing business objectives efficiently and effectively. Manager is an individual who takes the responsibility of controlling and administering the organization, preserving status quo. The five primary functions of a manager are planning, organizing, directing and motivating, coordination and control. A manger maintains the existing state of affairs and is risk averse.

Source: Surbhi S. (2016), Difference between entrepreneur and manager

- **OCCUPATION**

  An occupation is defined as a set of jobs whose main tasks and duties are characterised by a high degree of similarity. A person may be associated with an occupation through the main job currently held, a second job or a job previously held (ILO, 2012).

- **QUALIFICATION**

  'Qualification' means a formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards.

  Source: *GLOSSARY. RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning, http://www.eucen.eu/EQFpro/GeneralDocs/FilesFeb09/GLOSSARY.pdf*

- **SKILLS**

  Skills ' means the ability to apply knowledge and use know-how to complete tasks and solve work-related problems.

  Source: *GLOSSARY. RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning, http://www.eucen.eu/EQFpro/GeneralDocs/FilesFeb09/GLOSSARY.pdf*

- **SKILL GAP**

  Used as a qualitative term to describe a situation in which the level of skills of the employee or a group of employees is lower than that required to perform the job adequately, or the type of skill does not match the job requirements.

  Source: (Cedefop, 2010)

- **SKILL MISMATCH**

  An encompassing term referring to different types of skill gaps and imbalances such as over-education, under-education, over-qualification, under-qualification, over-skilling, skills shortages and surpluses, skills obsolescence and so forth. Skills mismatch can be both qualitative and quantitative, referring both to situations where a person does not meet the job requirements and where there is a shortage or surplus of persons with a specific skill. Skills mismatch can be identified at the individual, employer, sector or economy level.

  Source: (Andersen et al., 2010).

ATTACHMENTS

Appendix 1. The examples of the templates (concerning state of the art and higher education and outside of the higher education offer) completed by the project partners

Appendix 1.1. Example of template of cross-literature review results

Completed by Institute for Sustainable Technologies - National Research Institute - 1	
The authors with affiliations	Lucas van der Laan Ronel Erwee
Title of the publication	Foresight styles assessment: a valid and reliable measure of dimensions of foresight competence?
Journal title*	Foresight
Number of journal*/year of publication/pages	Vol. 14 Issue 5 (2012), pp.374-386
Database of the scientific article's retrieval*	EMERALD
Keywords (or phrases) by which the publication was identified	Foresight styles assessment, Foresight competence, Strategy level leaders, Structural equation modelling, Forward planning, Emergent strategy, Leaders
Main keywords/phrases of the publication	
Core foresight and entrepreneurial competences	Interrogates the future Future time orientated Interested in the long-term issues that define the future Envisions ''bigger picture'' futures Adjusts to new situations as future demands Balances multiples challenges and choices Helps others adapt/Is flexible/Activates action Flexible leadership/Change orientated influencer Adopts new trends/Confirms diffusion of innovation theory Experiments with new trends when they arise Opportunistic/Not cognitive trend analysis Preserves own position Mitigates and resists change
Convergence among futures studies and entrepreneurship	The application of foresight in company has the vital role in process of improvement of entrepreneurs' strategic choices
Convergence among futures studies and innovation	Innovativeness is the base of the foresight as a cognitive disposition
Convergence among futures studies and entrepreneurship and innovation	e.g. *strategic capacity of the organization in a result of convergence among futures studies and entrepreneurship or innovation*
Main highlights of the article (in bullets, up to 2500 characters including spaces)	The aim of the article is validation of the Foresight Styles Assessment (FSA). The author underlines the significant role of Gary's definition of foresight as competence of leadership and states that foresight is cognitive disposition. Abovementioned statement was formulated on the basis of the survey, which was conducted among 101 directors and 120 senior managers.
Other observations or comments	

Appendix 1.2. Example of template of domestic cross-literature review results

Completed by Bialystok University of Techology – 2	
The authors with affiliations	Mach Łukasz (Opole University of Technology)
Title of the publication in English	Foresight Research Based on the Type of Strategic Economic Forecasting Phenomena
Title of the publication in the national language	
Journal title*	The Wroclaw School of Banking Research Journal
Number of journal*/year of publication/pages	3(35)/2013/155-163
Database of the scientific article's retrieval*	BazEkon
Keywords (or phrases) by which the publication was identified	Foresight
Main keywords/phrases of the publication	Forecasting, Economic and social phenomenon forecasting, Scenarios of socio-economic development, Methodology of economic diagnosis
Core foresight and entrepreneurial competences	1) Ability to properly diagnose the current state of the organization; 2) Defining measurable goals to create a preferred future vision for the organization
Convergence among futures studies and entrepreneurship	Organizations that use foresight research represent an entrepreneurial attitude
Convergence among futures studies and innovation	The use of foresight in an organization initiates innovative undertakings
Convergence among futures studies and entrepreneurship and innovation	Strategic business opportunities of an organization as a result of convergence between futures research and entrepreneurship or innovation
Main highlights of the article (in bullets, up to 2500 characters including spaces)	This paper describes the necessary conditions to the process of forecasting of strategic foresight activities. This process consists of the analysis of the current situation that allows to develop a diagnosis of the study area and the projection part. The implications of the result of operations in the diagnosis and prognosis are to develop scenarios for the study area. This article also describes in a comprehensive way a part of the decision-making process for forecasting the result of strategic foresight, which will select the optimum development scenario.
Other observations or comments	

Appendix 1.3. Example of template of higher education offer review results

Completed by Institute for Sustainable Technologies - National Research Institute - 18			
A name of the subject/course	Strategic Foresight		
A name of tertiary education institution or research institution	Aarhus University		
A country	other (Denmark)		
A city	Aarhus		
A name of a department (if applies)	Department of Management		
A field of study	Business Administration		
A type of study	Stationary		
A type of course	Master degree		
A person teaching the subject (name and surname)	Rene Rohrbeck		
Core foresight and innovation/entrepreneurship competences in relation to knowledge	Introduction to foresight methods (scenarios, roadmapping, backcasting) Application of foresight methods into practice		
Core foresight and innovation/entrepreneurship competences in relation to skills	Comprehensiveness in identifying relevant aspects Detecting change ahead of competitors Being clear in understanding and distinguishing different contextual settings Providing specific and creative solutions Applying sophisticated IT tools in foresight		
Core foresight and innovation/entrepreneurship competences in relation to social competences	Teamwork How to act in a consultant-client relationship		
Key words to be searched for in the syllabuses	Select the CHECK BOXES below (you can choose more than one option) or you are free to add a new key word relevant to the analysis		
	X foresight	☐ innovation	☐ technology management
	☐ futures studies	☐ open innovations	☐ technology assessment
	X corporate foresight	☐ radical innovations	X network analysis
	X strategic foresight	☐ incremental innovations	X entrepreneurship
	X anticipatory intelligence	☐ new business models	X leadership
	☐ ambidexterity	☐ industrial revolution 4.0	☐ uncertainty
	Application of foresight		
Other observations or comments	Link to the course: http://kursuskatalog.au.dk/en/course/70495		

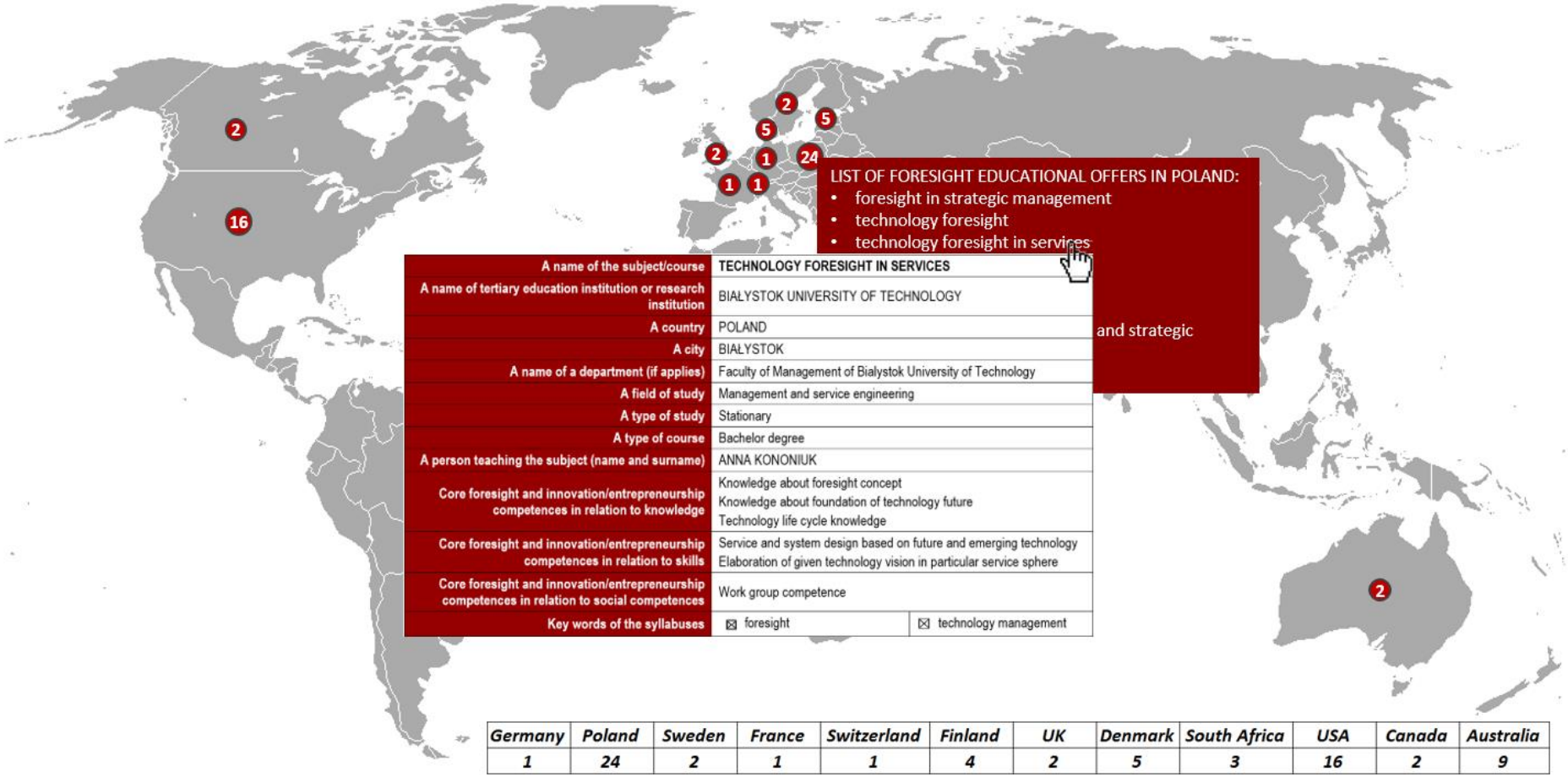
Appendix 1.4. Example of template of outside higher education offer review results

Completed by 4CF - 3						
A name of the course	Postgraduate Diploma in Futures Studies					
A name of the institution offering the course	University of Stellenbosch Business School					
A country	**South Africa**					
A city	Cape Town					
A name and surname of a person providing the course	Not provided					
Core foresight and innovation/entrepreneurship competences in relation to knowledge	History of futures thinking, systems dynamics, forecasting techniques, causal layered analysis, trend analysis, megatrend analysis, qualitative tools, scenario approach					
Core foresight and innovation/entrepreneurship competences in relation to skills	Understanding possible changes in long-term future and responding accordingly, holistic understanding of the social, ethical, political, technical and economic forces shaping the future, handling growing complexity in organisations, making strategic decisions					
Core foresight and innovation/entrepreneurship competences in relation to social competences						
Key words to be searched for in the course offer	Select the CHECK BOXES below (you can choose more than one option) or you are free to add a new key word relevant to the analysis					
	☒	foresight	☐	innovation	☐	technology management
	☒	futures studies	☐	open innovations	☐	technology assessment
	☐	corporate foresight	☐	radical innovations	☐	network analysis
	☐	strategic foresight	☐	incremental innovations	☐	entrepreneurship
	☐	anticipatory intelligence	☐	new business models	☐	leadership
	☐	ambidexterity	☐	industrial revolution 4.0	☐	uncertainty
	Systems thinking, philosophy					
Other observations or comments	The modules covered are: applied philosophy, managing for change, principles of futures studies, applied systems thinking, measuring and making the future, understanding the world					

Appendix 2. The example of the template concerning identified business practices and completed by the project partners

Completed by Free University Berlin – Futur Institut - 1	
A name of the enterprise	BASF
A country	**Germany**
A city	Ludwigshafen and globally
A field of activity	Chemical industry
A size of the enterprise	According to website BASF has 100.000 employees worldwide
What was the scope of foresight practice? (a short description, up to 1500 characters including spaces)	BASF Future Business GmbH (BFB) was created as a global innovation unite. It is a conglomerate of business and education to further R&D and innovation-management within the company and the regions. BFB is set in the major global business regions in Europe, Americas and Asia. It is based on the knowledge that any successful business venture of the future needs to be invested in today. Their work is on the one hand to further develop existing products and technologies with various research-competence-centres. On the other hand they research and tap into futures markets and new technologies especially outside the core business of BASF. The focus there is on sustainable development as well as the role of chemistry. The process at BFB consists of all three steps of a new business venture starting with Scouting & Evaluating, Product-development and the Launch. But not all concepts that are being developed become real businesses. Throughout the ‚life' of such procedure BFB sifts out the ones that seem the least likely to succeed. This is done through a Gate-Principal: the three steps are structured into five phases – 1) opportunities fields 2) business case 3) Lab phase 4) Pilot phase 5) Launch and each phase starts out with a gate-keeper, who evaluates according to certain technical and commercial milestones.
Core foresight and innovation/entrepreneurship competences	competences: 1) able to develop a fundamental understanding of complex issues, 2) skill of research and analysis of data – quantitive and qualitative (e.g. interviews), 3) interdisciplinary competencies, 4) problem solving, 5) system thinking, 6) competency of a visionary, 7) inquisitiveness, 8) creatively driven search for new opportunities among promising topics as well as the ability to do a 9) substantiated, well-structured market and technology analysis to develop a 10) strategy for market entry, 11) communication to report results and create synergies 12) ablilty to except other levels of work-experience13) willing to learn
The source of knowledge about the foresight activities of the enterprise	Song, Anja; Hormuth, Wolfgang: „Die BASF Future Business GmbH. Vom Trendscouting zum Aufbau neuer Geschäftsfelder" (p. 181-194) published in: Popp, Reinhold; Zweck, Axel (Hrsg.) (2013) "Zukunftsforschung im Praxistest". Schriftenreihe: Zukunft und Forschung. Bd. 3. Springer VS. Berlin, Heidelberg. / 419 pages https://www.basf.com/de/en/company/about-us/companies/BASF-New-Business-GmbH.html
Other observations or comments	The business practice has been choosen as an example of a German company instilling foresight activies into their innovation and product development process. The third-party sources can only give a brief overview. Therefore no new insights on competences have been found.

Appendix 3. The geographical distribution of higher education offer and foresight courses in individual countries



A name of the subject/course	TECHNOLOGY FORESIGHT IN SERVICES
A name of tertiary education institution or research institution	BIAŁYSTOK UNIVERSITY OF TECHNOLOGY
A country	POLAND
A city	BIAŁYSTOK
A name of a department (if applies)	Faculty of Management of Bialystok University of Technology
A field of study	Management and service engineering
A type of study	Stationary
A type of course	Bachelor degree
A person teaching the subject (name and surname)	ANNA KONONIUK
Core foresight and innovation/entrepreneurship competences in relation to knowledge	Knowledge about foresight concept Knowledge about foundation of technology future Technology life cycle knowledge
Core foresight and innovation/entrepreneurship competences in relation to skills	Service and system design based on future and emerging technology Elaboration of given technology vision in particular service sphere
Core foresight and innovation/entrepreneurship competences in relation to social competences	Work group competence
Key words of the syllabuses	☒ foresight ☒ technology management

Germany	*Poland*	*Sweden*	*France*	*Switzerland*	*Finland*	*UK*	*Denmark*	*South Africa*	*USA*	*Canada*	*Australia*
1	*24*	*2*	*1*	*1*	*4*	*2*	*5*	*3*	*16*	*2*	*9*

Appendix 4. The geographical distribution of business foresight practices in individual countries

Germany	Italy	Spain	Poland	Austria	The Netherlands	UK	France	Finland	Portugal	Liechtenstein	USA	Singapore
20	2	7	3	1	6	2	1	3	1	1	6	1

Appendix 5. A pilot list of 39 competences

1. The ability to define, identify and analyze trends within micro- and macroenvironment of the company

2. The ability to find and interpret weak signals of change and disruptions (wild cards and abnormal phenomena)

3. The ability to identify factors influencing the use of strategic foresight by companies

4. The ability to define measurable goals to create preferred future vision for the organization

5. The ability to work in teams

6. The ability to possess *guerilla skills* to challenge assumptions

7. The ability to gather, analyze process and interpret data (also using IT tools)

8. The ability to act proactively (autonomous strategic behavior, enterprising spirit)

9. Reflexive capa city

10. The ability to develop measurement system to control innovation initiatives and strategic direction

11. Coaching skills

12. The ability to communicate internally, interdisciplinary and with stakeholders

13. The ability to manage projects

14. The ability to develop organizational resilience

15. The ability to run strategic foresight within organization

16. Systemic thinking

17. Risk-taking capability

18. The ability to manage change and uncertainty (also dynamic capability)

19. The ability to build networks both internally and externally

20. The ability to deal with complexity

21. Understanding dangers of efficiency

22. The ability to develop and implement strategies

23. Time Competence (time-organizing skills, utilizing real-time, making optimal use of the diversities of time, appreciation of slow life, developing futures thinking, and futures consciousness)

24. The ability to think out of the box

25. The ability to transform new ideas into business practice

26. Capacity for design thinking

27. The ability to implement scenario approach within organization

28. The ability to create organizational vision (both collective and individual)

29. The ability to Identify goods or services people want

30. Accepting incompleteness of knowledge

31. Non-linear thinking

32. The ability to apply various future studies methodologies

33. The ability to implement selected methods of technology management (technology assessment, technology mapping, technology life cycle, prioritisation, technology audit and roadmapping)

34. The ability to perceive unmet consumer needs

35. The ability to look for products that provide real benefit

36. Seizing high-quality business opportunities

37. Maximizing results in resource allocation

38. Seeing the big picture

39. Tolerance of ambiguity

beFORE

NOVEMBER 2017