

The Application of Cluster Analysis for the Selection of Key Competences of Future-Oriented Entrepreneurs

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Trends and megatrends affecting the labour market are changing rapidly. Inevitable changes force a permanent need to redefine employees' competences in order to meet employers' expectations. The scientific problem raised by the authors of the article is defining a methodology of identifying competences of future-oriented entrepreneurs. The aim of the article is to present the potential of cluster analysis for the selection of key competences of future-oriented entrepreneurs in the context of foresight research. The main research methods applied for this study were literature review and cluster analysis. Literature review covered global literature review, domestic literature review, higher education offer review, commercial foresight courses review as well as case studies. Both extensive literature review and the analysis of business practices allowed to identify more than one thousand six hundred competences of a future-oriented entrepreneur. The huge amount of competences were then the subject to preliminary assessment which resulted in the list of 39 items. The application of cluster analysis enabled to further reduce the number of competences. Finally, seven competences to be mastered by future-oriented entrepreneurs could be recommended such as, but not limited to: the ability to find and interpret weak signals of change and disruptions (wild cards and abnormal phenomena); the ability to act proactively; the ability to manage change and uncertainty; the ability to run strategic foresight within organization, the ability to create organizational vision (both collective and individual); and seeing the big picture.

Keywords: Cluster Analysis; Competences; Competence Selection; Future-Oriented Entrepreneur, Future Thinking.

Introduction

The factors determining the contemporary labour market are changing very quickly. Genetics, robotics, nanotechnology, new business models, aging society, but also new customer demands and shorter production cycles significantly affect the nature of work and employers' expectations. Today's and tomorrow's relevant competences may prove inadequate to meet the challenges faced by workers in a globalised labour market dominated by new technologies (McGuiness *et al.*, 2017; Bolinska *et al.*, 2019; Roztocki & Narcyz 2015; Insights into skill shortages and skill mismatch: learning from Cedefop's European skills and jobs survey, 2018)

The scientific problem raised by the authors of the article is defining a methodology of identifying the competences of future-oriented entrepreneurs. The aim of the article is to present the possibilities of application of cluster analysis for the selection of key competences of future-oriented entrepreneurs on the basis of data collected within "Becoming Future-Oriented Entrepreneurs in universities and companies – beFORE" project, in which the authors of the paper took part. Initiative is funded under the Erasmus + Knowledge Alliance scheme. The project involved ten partners (universities and companies) representing four countries such as Poland, Italy, Germany and Spain. The

project has been coordinated by Lukasiewicz Research Network – The Institute for Sustainable Technologies located in Poland. The goal of beFORE project was to increase future literacy among students, academics and entrepreneurs as well as to guide individuals and organisations in their future preparedness. The identified by the researchers competences – on the basis of the literature review and the extensive analysis of case studies in which foresight research was applied – were evaluated by renown foresight experts and project partners with regard to their importance for six dimensions called: a future-oriented entrepreneur, insight, visioning strategy development, innovating and leadership with the application of 5-point Likert scale. Finally, the authors of the article, recommend 7 competences of strategic foresight to be mastered by future-oriented entrepreneurs.

Theoretical Framework and Research Method

Competences have been an issue of interest in scientific literature since the beginning of the 20th century (Volpentesta & Felicetti, 2011). There are many ways to understand the notion "competence". Often the terms competence, skills, qualifications, rights and duties are used interchangeably. In reality, however, these are not the same concepts. Clear distinction between competences, knowledge

and skills is often also problematic (Kinkel *et al.*, 2017). According to Hertle and others, knowledge is the narrowest concept, including certain abilities. Qualifications take precedence over knowledge and competences cover the other two terms (Hertle *et al.*, 2015). Competence can therefore be understood as the relationship between a person and the tasks to be carried out in the course of a professional career, i.e. the knowledge and skills required to carry out a specific task effectively (Volpentesta & Felicetti, 2011). Competences also have certain essential characteristics: they are related to a specific task or professional activity; they are variable and therefore subject to development; they change with experience and professional and life development; they are measurable (Kubat & Filipowicz, 2016; Gudanowska *et al.*, 2018).

The literature shows a trend related to the search for appropriate competences that should characterise an educated entrepreneur (Gonzalez & Kobylinska, 2019) so that one can successfully (Jain, 2011; Lewrick *et al.*, 2010) and in a sustainable way (Coyne, 2016) carry out his work. Already in the 80s, Ronstadt pointed out that entrepreneurship and related competences can and must be mastered (Ronstadt, 1987). It is also important to realize that these are competences different from those assigned to general managerial competences (Morris *et al.*, 2013). However, despite the discussions in the literature on understanding competences of future-oriented entrepreneurs, it is important to search for competences that allow to adapt to the requirements of the contemporary market, especially in the context of competences related to creativity and innovation (Edwards-Schachter *et al.*, 2015).

Among the important competences of entrepreneurs are those related to anticipation, intuition and perception of new opportunities. In this context, in comparison with the concepts and approaches presented in the literature, foresight stands out (Mosakowski, 1998). Foresight activities should be part of the toolkit for entrepreneurship (Gheorghiu *et al.*, 2016). Also in the context of corporate social responsibility – thinking about the future is one of the important competence areas of a responsible entrepreneur (Osagie *et al.*, 2016).

In a world of fast changes and uncertainty, futures literate individuals will increase their employability, as suggested in the 2006 European Reference Framework for Key Competences for Lifelong Learning: the challenge lies on how to provide an entrepreneurship education that offers competences matching the characteristics of the current state of the world: i) rapid technological and organizational change and need for innovation (Kononiuk, Sacio-Szymanska & Gaspar, 2017); ii) "information overload/pollution" (Levitin, 2014); iii) "weak signals" (Kuusi & Hiltunen, 2011).

Based on a survey conducted among a large group of directors and senior managers, van der Laan and Erwee indicate that foresight is a cognitive disposition and they highlight the importance of foresight in the context of leadership (van der Laan & Erwee 2012). Foresight may affect both individual and organizational learning (Baskarada *et al.*, 2016). Future-oriented thinking is the core competence because it is the foundation for imagination, strategy development and the creation of a

preferred future in organizations (Inayatullah, 2008). Grimm provides organizations with a useful Foresight Maturity Model (FMM) that allows organizations to identify best practices in foresight and measure their practices (Grimm, 2009; Kononiuk, 2014).

Thinking about the future and knowing how to use appropriate methods related to analysing and anticipating the future should be an important element of education in business schools (Ratcliffe & Ratcliffe 2015), which will raise future-oriented entrepreneurs. An interesting view on competences of future-oriented entrepreneurs is presented by Heinonen and Ruotsalainen (2012). According to the authors, in a holistic, creative, and meaning-based neogrowth of economy, general competences and skills are especially needed. Instead of high specialization, multiple competences will become critical in future work. The workforce will be utilizing the whole range of the human potentials and skills more and more. Soft competences i.e., skills of communication, interaction, and socio-cultural sensemaking will, in particular, gain in importance. The following set of future skills and competences are summarized in the concept of the Futures Competences Diamond, consisting of seven edges (Heinonen, 2012) including the following competences of the future-oriented entrepreneur: interaction competence, collaboration competence, time competence, technology competence, environmental competence and systems competence.

The main research methods applied for this study were literature review and cluster analysis. Literature review covered global literature review, domestic literature review, higher education offer review, commercial foresight courses review and case studies. Case studies enable to identify competences of future-oriented entrepreneur retrieved from well documented 52 business practices. Both extensive literature review and the analysis of business practices allowed to identify more than one thousand six hundred competences of a future-oriented entrepreneur. The huge amount of competences, their heterogeneity and a different level of granularity presented a major challenge for the researchers. The competences were then the subject to preliminary assessment. The limited set of competences (39 items) was a subject to cluster analysis.

Cluster analysis is a method of grouping that allows for the identification of groups containing similar objects (Tryon, 1939). Clustering techniques are used in many different research fields. A perfect summary of many published studies that inform the reader about the results of the analysis of clusters is provided by Hartigan (Hartigan, 1975). This method is representative of the so-called methods of analysis of interdependence, which means that all variables in the analysis are treated as interdependent without distinguishing between dependent (effects) and independent variables (causes). The purpose of the analysis in such a case is usually to identify the structure of the examined set of variables or objects. Cluster analysis as a method of grouping allows for the identification of internally consistent groups of objects.

Data Collection and Research Process

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. As the set of competences was very extensive and two stages of grouping were proposed: stage I – preliminary and stage II – basic.

First stage 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; and other foresight conceptual frameworks posited by Habegger (2010); Miles and Popper (2008) and Magruk (2014). 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.

Second stage 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 subgroups. 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” group. As the scope of the project was 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. Furthermore, these competences were not future-oriented and very general in nature. The clusters mentioned above embraced such competences as assertiveness, need for autonomy, tolerance, management skills, to name but a few. After the rejection of “personal competences” and “nowhere else competences”, the group comprised 50 working clusters of the competences. Then, a further analysis of 50 working clusters was carried out. The initial list of 50 clusters was juxtaposed with results of the literature review of well-established published works on competences (Spencer & Spencer 1993; Boyatzis 1982; Bird 1995; Chandler & Jansen 1992). The results of the juxtaposition were discussed and further analysed by the authors of the article and finally the list of 50 clusters was further reduced to 39 competences, which were subject to internal assessment (table 1).

Table 1

Competences of a Future-Oriented Entrepreneur

Symbol	Competency
C_1	<i>the ability to define, identify and analyze trends within micro- and macroenvironment of the company</i>
C_2	<i>the ability to find and interpret weak signals of change and disruptions (wild cards and abnormal phenomena)</i>
C_3	<i>the ability to identify factors influencing the use of strategic foresight by companies</i>
C_4	<i>the ability to define measurable goals to create preferred future vision for the organization</i>
C_5	<i>the ability to work in teams</i>
C_6	<i>the ability to possess guerrilla skills to challenge assumptions</i>
C_7	<i>the ability to gather, analyze process and interpret data (also using it tools)</i>
C_8	<i>the ability to act proactively (autonomous strategic behavior, enterprising spirit)</i>
C_9	<i>reflexive capacity</i>

Symbol	Competency
C_10	<i>the ability to develop measurement system to control innovation initiatives and strategic direction</i>
C_11	<i>coaching skills</i>
C_12	<i>the ability to communicate internally, interdisciplinary and with stakeholders</i>
C_13	<i>the ability to manage projects</i>
C_14	<i>the ability to develop organizational resilience</i>
C_15	<i>the ability to run strategic foresight within organization</i>
C_16	<i>systemic thinking</i>
C_17	<i>risk-taking capability</i>
C_18	<i>the ability to manage change and uncertainty (also dynamic capability)</i>
C_19	<i>the ability to build networks both internally and externally</i>
C_20	<i>the ability to deal with complexity</i>
C_21	<i>understanding dangers of efficiency</i>
C_22	<i>the ability to develop and implement strategies</i>
C_23	<i>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)</i>
C_24	<i>the ability to think out of the box</i>
C_25	<i>the ability to transform new ideas into business practice</i>
C_26	<i>capacity for design thinking</i>
C_27	<i>the ability to implement scenario approach within organization</i>
C_28	<i>the ability to create organizational vision (both collective and individual)</i>
C_29	<i>the ability to identify goods or services people want</i>
C_30	<i>accepting incompleteness of knowledge</i>
C_31	<i>non-linear thinking</i>
C_32	<i>the ability to apply various future studies methodologies</i>
C_33	<i>the ability to implement selected methods of technology management (technology assessment, technology mapping, technology life cycle, prioritisation, technology audit and roadmapping)</i>
C_34	<i>the ability to perceive unmet consumer needs</i>
C_35	<i>the ability to look for products that provide real benefit</i>
C_36	<i>seizing high-quality business opportunities</i>
C_37	<i>maximizing results in resource allocation</i>
C_38	<i>seeing the big picture</i>
C_39	<i>tolerance of ambiguity</i>

(source: Authors' own Study)

Finally, 23 renown foresight experts took part in the internal assessment of 39 competences of a future-oriented entrepreneurs as well as the domains of his/her activity such as: insight, visioning, strategy development, innovating and leadership. The definitions of the domains were as follows:

- insight – interpreting and responding to the present, assessing state of the art of factors shaping business activity;
 - visioning – developing a vision for the company's future (both collective and individual);
 - strategy development – a plan of action designed to achieve a long-term goal, capable of being changed in response to shifting market dynamics;
 - innovating – applying new ideas to produce a tangible business result such as a new product, service, or process;
 - 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.
- The domains of a future-oriented entrepreneur activity were defined by the authors of the article on the basis of Foresight Maturity Model posited by Grimm (Grimm 2009). The model takes into consideration such aspects as

the following: leadership, framing, vision building, planning, scanning and forecasting. The authors of the article decided to get rid of the framing dimension as its definition in the original model is quite vague and include it into strategy development in terms of achieving the goals of the company. This domain includes also planning. Forecasting dimension from the Grimm FMM model was assigned to vision building suggested by the authors of the article. Moreover, the authors of the article decided to add new dimension, namely innovating. Running innovative activities by future-oriented managers is widely recommended in the existing published works on the interconnection between entrepreneurship and innovation (Cooper & Vlaskovits 2013; Gheorghiu et.al., 2016; Mosakowski, 1998; Rohrbeck, 2010).

The measurement tool was a 5-point Likert's scale where 1 meant that the competence is not very important, whereas 5 meant that a given competence is very important both for a future-oriented entrepreneur or the domains of his/her activity.

Results of the Research

The obtained results enabled to calculate arithmetic mean values of the assessment of the 39 competences in the given dimensions. In this way, a set consisting of N=39 cases and six variables was obtained (table 2). On the basis of the collected data, the authors created rankings of the competences importance for a future-oriented entrepreneur and domains of his/her activity. From the perspective of the prepared rankings, the most important competences for future oriented manager were: *the abilities to transform new ideas into business practice* (C_25), *to manage change and uncertainty (also dynamic capability)* (C_18), *to run strategic foresight within organization* (C_15) and *seeing the big picture* (C_38) – arithmetic mean for the assessment obtained above 4,5. The most important from the perspective of the insight dimension was *the ability to gather, analyze process and interpret data (also using it tools)* (C_7 – in this case it was the highest average obtained in this dimension – 4,26), in turn for the visioning dimension *the ability to think out of the box* (C_24) and *to create organizational vision (both collective and individual)* (C_28). However, from the perspective of strategic development dimensions, the most important ones turned out to be *the ability to develop and implement strategies* (C_22). For the dimension innovating it was *the ability to think out of the box* (C_24) and for the dimension leadership it was *the ability to communicate internally, interdisciplinary and with stakeholders* (C_12).

In table 2, assessments of the competences evaluated as important (arithmetic average ≥ 4) both for a future-oriented entrepreneur and domains of his/her activity were distinguished.

Table 2
Arithmetic Mean Values for the Assessment of
39 Competences

Symbol of a competence	Importance of a competence					to leadership
	for a future oriented entrepreneur	to insight	to visioning	to strategy development	to innovating	
C_1	4,48	3,96	4,30	4,39	3,70	2,91
C_2	4,43	3,96	4,48	4,09	4,13	3,22
C_3	3,61	3,39	3,43	3,48	2,74	2,83
C_4	4,22	3,22	3,96	4,30	3,30	4,00
C_5	4,13	3,17	3,17	3,83	4,30	4,48
C_6	4,04	3,52	3,87	3,61	4,22	3,57
C_7	4,13	4,26	3,74	4,17	3,65	3,26
C_8	4,35	3,43	4,13	4,13	4,09	4,35
C_9	4,17	4,13	3,96	4,09	3,78	3,57
C_10	3,57	3,17	2,96	3,96	3,87	3,35
C_11	3,30	2,43	2,52	2,61	2,96	4,35
C_12	4,39	3,39	3,57	3,91	3,74	4,57
C_13	4,43	3,04	2,91	3,65	3,83	4,43
C_14	4,13	3,22	3,17	4,09	3,87	4,00
C_15	4,52	3,87	4,35	4,39	4,00	3,78
C_16	4,43	3,78	3,65	4,35	3,65	3,48
C_17	4,26	2,87	3,61	3,74	4,30	3,83
C_18	4,57	3,26	3,96	4,22	4,26	4,35
C_19	4,39	3,26	3,52	3,78	3,91	4,26
C_20	4,35	3,91	3,96	4,13	3,87	3,78
C_21	3,57	3,30	3,13	3,70	3,22	3,43
C_22	4,43	3,39	3,61	4,78	3,96	4,00
C_23	4,39	3,26	3,26	3,74	3,26	4,13
C_24	4,35	3,70	4,61	3,91	4,61	3,48
C_25	4,57	3,39	3,78	4,30	4,48	3,70
C_26	3,78	3,00	3,57	3,83	4,26	2,91
C_27	4,13	3,35	4,17	4,04	3,48	3,30
C_28	4,43	3,30	4,52	4,22	3,52	4,39
C_29	3,87	3,48	3,83	3,78	3,96	3,43
C_30	3,57	3,22	3,30	3,52	3,22	3,17
C_31	4,17	3,61	4,39	3,70	4,39	3,48
C_32	4,04	3,70	4,09	4,13	3,65	3,43
C_33	3,91	3,61	3,52	3,74	3,91	3,30
C_34	4,17	3,74	4,30	4,09	4,17	3,30
C_35	4,09	3,57	3,61	3,87	3,87	3,17
C_36	4,30	3,43	3,61	4,17	3,96	3,65
C_37	3,74	3,13	3,00	3,70	3,17	3,83
C_38	4,52	4,17	4,48	4,39	4,13	4,04
C_39	3,30	2,96	2,96	2,96	3,26	3,04

(Source: Authors' own study)

In the next stage of the research process, correlations between variables (importance for a future-oriented entrepreneur and domains of his/her activity) were calculated.

All correlation coefficients presented in the table 3 are positive and their values indicate a moderate or strong correlation between assessments of the importance of

competences for areas and assessments of the importance of competences for a future-oriented entrepreneur. A positive correlation means that with the increase in the importance of competences for domains one could observe an increase in the importance of competences for a future-oriented entrepreneur. In particular, we can distinguish two domains that have the strongest influence on the future-oriented entrepreneur: strategy development (correlation coefficient = 0.758197) and visioning (correlation coefficient = 0.622013)

Table 3

The Correlation between the Variables

Variable	Correlation coefficient are significant with the p < 0,05 N=39				
	to insight	to visioning	to strategy development	to innovating	to leadership
for a future oriented manager	0,478338	0,622013	0,758197	0,555754	0,406472

(source: Authors' own study)

In the next step of the analysis, the competences were grouped according to the similarity of the assessment in five dimensions with the help of cluster analysis. Objects (competences) were grouped into the groups of objects similarly evaluated according to some variables (in this case: domains). A dendrogram was prepared, on the basis of which four clusters emerged as the first stage of the cluster analysis. Then, for the defined four clusters, with the help of k-means method, the content of each cluster was specified as well as the average marks for the dimensions assessment in the competences clusters. The content of the competences clusters achieved with the help of dendrogram (figure 1) and k-means method was the same (plot of means for each cluster are presented in figure 2).

As a result of cluster analysis, four clusters were obtained. The first one was characterized by the highest scores for the following variables (dimensions): insight (3,86), visioning (4,19), strategy development (4,14) and innovating (3,94). At the same time it was cluster that has obtained very low score for the leadership dimension (3,46). Competences that were included in the cluster are listed in table 4. The closest to the first cluster center were competences C_2, C_9, C_15, C_20, C_32 and C_34. It means that they were given the most similar marks within the cluster (distance measure $\leq 0,2$). The second cluster was characterized by the low scores for dimension insight (3,27), average scores for dimension visioning (3,62), high scores for dimension strategy development (4,06), a little bit lower but still high scores for dimension innovating (3,82) and very high scores for the dimension leadership (4,27). Competencies from this cluster are listed in table 4, and among them C_12 and C_19 are the closest to the center of the second cluster. Those two competences were given the most similar marks within the cluster (distance measure $< 0,2$). The lowest scores in all analyzed dimensions (insight – 3,07; visioning – 3,06; strategy development – 3,33; innovating – 3,09 and leadership – 3,44) is a feature of the third cluster. As all of the competences evaluated in the third cluster (table 4) received low scores both for the importance for a future-oriented manager as well as for the domains of his activity. Therefore, on the basis of the cluster analysis results, it was recommended to exclude competences from this cluster from the further analysis. The last – fourth cluster was characterized by the low importance for dimension insight (3,27), average score for dimension visioning (3,59), quite high score for dimension strategy development (3,89), very high score for dimension innovating (4,09) and low score for dimension leadership (3,43). Competencies from this cluster are also listed in table 4. The closest to the center of this cluster with the most similar marks within the cluster (distance measure $< 0,2$) were competences C_29, C_33, C_35 and C_36.

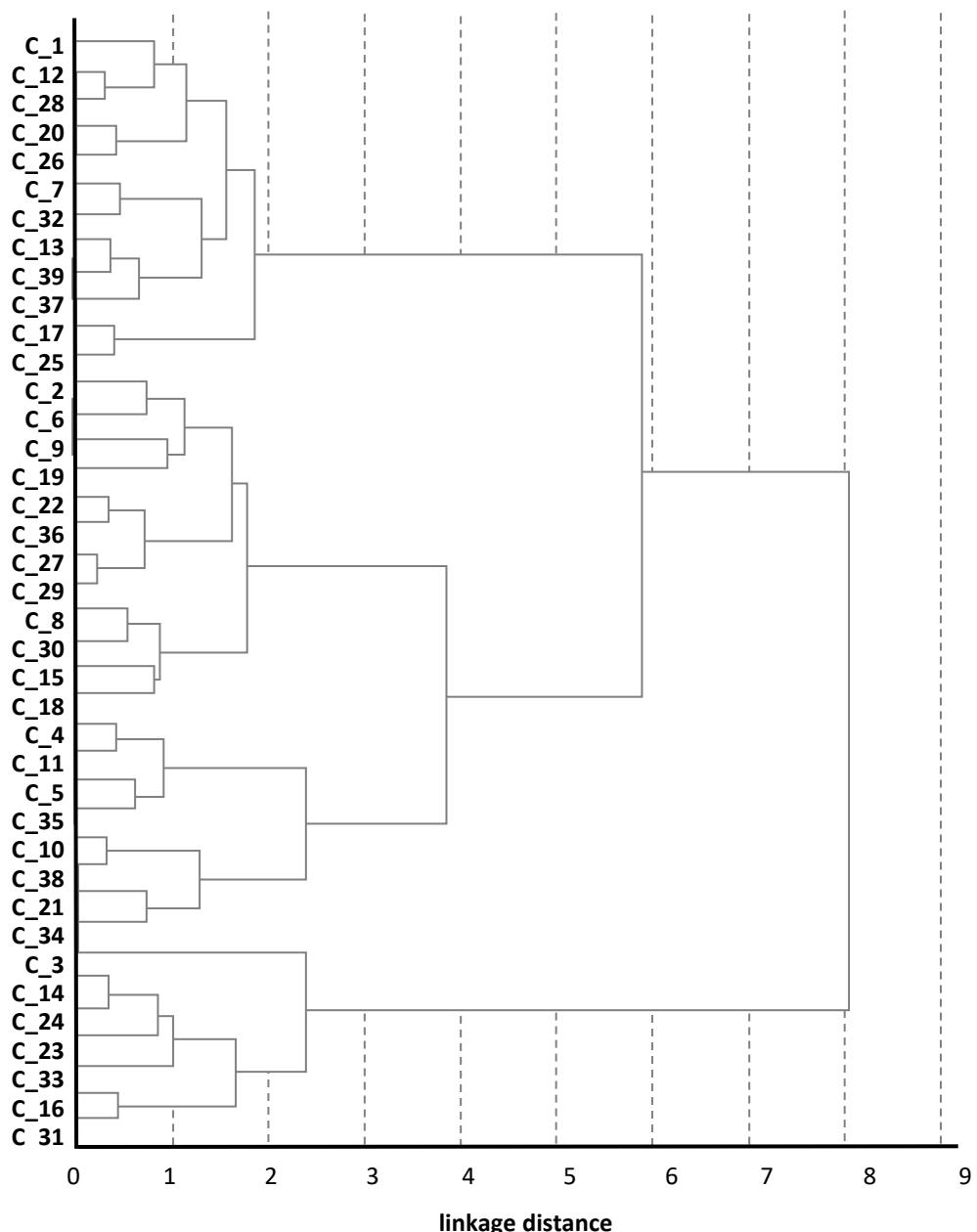


Figure 1. The Dendrogram of the Competences – Tree Diagram for 39 Cases, Ward’s Method, Euclidean Distances
(Authors’own Study based on the Results Obtained in Statistica Software)

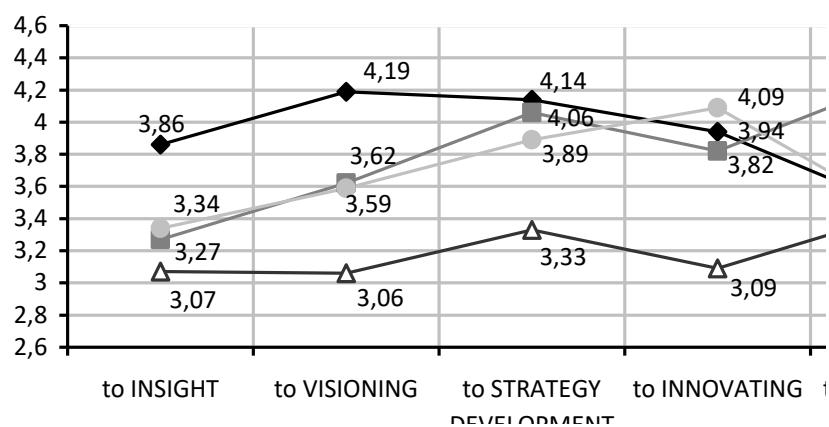


Figure 2. Plot of Means for Each Cluster
(Authors’own study based on the results obtained in Statistica software)

Table 4

Clusters of Competences – Elements and the Distances from the Center of the Cluster (Own Elaboration)

Number of cluster	Competence symbol	Distance from the center
1	C_1	0,299461
	C_2	0,196785
	C_7	0,313968
	C_9	0,183319
	C_15	0,195302
	C_16	0,289787
	C_20	0,181165
	C_24	0,374540
	C_27	0,318612
	C_31	0,318246
	C_32	0,155135
	C_34	0,148625
	C_38	0,351011
2	C_4	0,322051
	C_5	0,327343
	C_8	0,273139
	C_12	0,163591
	C_13	0,384465
	C_14	0,234038
	C_18	0,260516
	C_19	0,137069
	C_22	0,354561
	C_23	0,335638
	C_28	0,436071
3	C_3	0,393005
	C_11	0,640040
	C_21	0,205342
	C_30	0,203493
	C_37	0,243784
	C_39	0,263414
4	C_6	0,210153
	C_10	0,314685
	C_17	0,296824
	C_25	0,292691
	C_26	0,289807
	C_29	0,143520
	C_33	0,173106
	C_35	0,184159
	C_36	0,176827

The authors made a juxtaposition of the scores for competences importance for a variable (dimension) *for a future-oriented entrepreneur* in the competences clusters (table 5).

The highest scores for the variable were obtained in the first and the second cluster. The most important *for a future-oriented entrepreneur* (table 5) are eleven competences from the second cluster (mean=4,35) and thirteen competences from the first cluster (mean=4,30). The scores are quite homogenous (coef.var = 3,14 % and coef.var = 3,94 %). In the fourth cluster, there are nine competences which importance *for a future-oriented entrepreneur* are also high (mean = 4,04), but heterogeneity of scores was a little bit greater (coef.var = 7,49 %) than in the remaining clusters. The least important are the competences from the third cluster (mean = 3,51). In this case the scores were quite homogenous (coef.var = 4,97 %).

On the basis of the correlation analysis it turned out that the dimensions most closely correlated with the assessment of competences in terms of their importance for the future-oriented manager are strategy development and visioning. On the basis of the results of cluster analysis, it is possible to recommend several sets of competencies depending on the

criteria to be adopted. It is important to underline that the analysis of the whole set of competences resulted in the rejection of the third cluster of competences (covering competences C_3, C_11, C_21, C_30, C_37 and C_39). The competences form this cluster received low scores for the importance for a future-oriented manager and for the domains of his activity.

Table 5

The Juxtaposition of the Scores for Competences Importance for a Variable *a Future -Oriented Manager* in the Competences Clusters

	Descriptive Statistics					
	Valid N	Mean	Min	Max	Std. Dev.	Coef. Var.
CLUSTER 1	13	4,30	4,04	4,52	0,17	3,93
CLUSTER 2	11	4,35	4,13	4,57	0,14	3,14
CLUSTER 3	6	3,51	3,30	3,74	0,17	4,97
CLUSTER 4	9	4,04	3,57	4,57	0,30	7,49

(source: Authors' own study)

Finally the authors posited one set of competences for the further analysis. It comprises average high marks for the importance for a future-oriented entrepreneur and at least 3 average high marks for the domains of his activity. Taking into account those criteria the list of the following 7 competences to be mastered by future-oriented entrepreneurs can be recommended:

- the ability to find and interpret weak signals of change and disruptions (*wild cards and abnormal phenomena*) (C_2);
- the ability to act proactively (*autonomous strategic behaviour, enterprising spirit*) (C_8);
- the ability to run strategic foresight within organization (C_15);
- the ability to manage change and uncertainty (C_18);
- the ability to create organisational vision (*both collective and individual*) (C_28);
- the ability to perceive unmet consumer needs (C_34);
- seeing the big picture (C_38).

The suggested set became the basis for further analyses. Finally, for the list of competences, that could be mastered by future-oriented entrepreneurs, fourteen competences were selected by juxtaposing: results of the cluster analysis, the internal assessment of the competences importance for a future-oriented entrepreneur, the external assessment of the competences importance for a future-oriented manager carried out during FEN meeting¹ and ISPIM conference² and comments to the competences provided both by internal and external experts. It should be noted that cluster analysis was a very important stage of the whole selection process, drawing attention to the competences important from the perspective of several equal dimensions.

¹ 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 was conducted

² XXVIII ISPIM Innovation Conference Composing the Innovation Sympony (18-21 June 2017 – Vienna, Austria) – the ranking of the importance of the competences for a future-oriented manager/entrepreneur and a list of the competences posited by participants of the Futures literacy workshop

Conclusions

The theoretical contribution of the paper consist in presenting comprehensive methodology of cluster analysis applied for the determining the competences of future-oriented entrepreneurs. In the opinion of the authors, cluster analysis is a useful tool of grouping, but it should be juxtaposed with the qualitative assessment. In the case of the research presented in the article, the identified huge and diverse set of competences forced the authors of the research to conduct their initial selection and grouping, before applying the cluster analysis. Conducting a series of assessments and the necessity to narrow down the set of competences resulted in the fact that some of them, although very highly rated in the ranking resulting from a single evaluation and poorly rated in the others, were excluded.

In further research it would be worthwhile to look at such comments and deepen the research in their scope in order to explain such a large difference in the scores achieved by individual evaluations (e.g. *risk taking*)

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- capability – C_17). *Coaching skills* (C_11) and *capacity for design thinking* (C_26) proved to be interesting competences, to which further in-depth consideration could also be devoted. They were evaluated as low for a future-oriented entrepreneur, but at the same time, they were evaluated as very high for leadership and innovating.
- Also an interesting observation could be made with the ability to look for products that provide real benefit (C_35). It was evaluated as high for a future-oriented entrepreneur, but at the same it obtained low marks for the fields of his/her activity which could indicate that one more domain in the analysis is needed (e.g. market orientation).
- All in all, the cluster analysis conducted as part of the “Becoming Future-Oriented Entrepreneurs in universities and companies – beFORE” project enabled the authors to indicate the set of competences of future-oriented entrepreneurs, but also provided information on the possibilities of further research studies.

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