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A Challenge-Based Experiment Aiming to Develop Strategic Thinking an Inquiry into the Role of Stimulating Creativity for out-of-the-Box Thinking

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An inquiry into the role of stimulating creativity for out-of-the-box thinking

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Abstract

In the era of machine-to-machine communication, the future purchasing and supply management workforce increasingly requires human features that computers need to think more out-of-the-box or strategically. Therefore, institutions for higher education need to introduce learning objectives for these higher-order thinking skills. The question is how to teach and assess thinking skills since these deviate from the common cognitive objectives such as learning knowledge or professional skills. This research differentiates between necessary and sufficient conditions. Evidence shows that students, to develop strategic thinking, need to be result-driven, open to new experiences and curious before the course starts. The course must develop the intrapersonal traits of "creativity", "curiosity", "intuition", "playfulness", "fantasy thinking", "proactivity", "flexibility", "agility", "persistence", "risk-taking", "analytical thinking", "consultancy skills", and "task management". Moreover, the course must be attractive to stimulate the "willingness to learn". Moreover, "analytical and holistic thinking" must be developed. These are necessary conditions, meaning that their absence leads to ineffectiveness. With regression techniques, evidence is shown that "creativity" is also sufficient for developing strategic thinking. Higher "anxiety" levels prevent the student from thinking strategically out of the box. The findings align with the literature that strategic thinking involves analytical thinking, intuition and creativity and adds the necessary and sufficient competences and barriers.

1. The need for "creativity" to develop "strategic thinking" skills for the future workforce

Labour market demands and job requirements in purchasing and supply management (PSM) are changing due to sustainability issues, societal challenges, digital transformations, and the implications of the internet-of-things (Schulze & Bals, 2020; Schulze, Bals, & Johnsen, 2019; Stek & Schiele, 2021). Future professionals will work in a highly automated environment of machine-to-machine communication. In such an environment, intrapersonal character traits will make a difference, *"such as social intelligence, creativity and perception/manipulation"* (Von der Gracht, Giunipero, & Schueller, 2016, p. 9). Therefore, the future workforce needs *"subject-based know-how as well as […] high-level transversal competences and skills such as joint problem solving, critical thinking, and self-regulated learning"* and requires the *"ability to apply knowledge and skills flexibly in different contexts"* (Hoidn, 2017, p. 2).

These "transversal competences", also referred to as "personal skills", "interpersonal skills and intrapersonal traits", "non-cognitive skills", "transferable skills", or "soft skills", are increasingly essential for the current and future workforce to become competent (Andrews & Higson, 2008; Bailly & Léné, 2013; Forrest & Swanton, 2021; Giunipero & Pearcy, 2000; Stek, 2022; Stek & Schiele, 2021; WEF, 2015). The concept of "*competence"* is a construct of *"knowledge, skills, abilities and other characteristics (KSAOs) that are needed for effective performance in the job in question"* (Campion et al., 2011, p. 226). Delamare-Le Deist and Winterton (2005, p. 39) add that *"The competences required of an occupation include both conceptual (cognitive, knowledge and understanding) and operational (functional, psycho-motoric and applied skill) competences. The competences more associated with individual effectiveness are also both conceptual (meta-competence, including learning to learn) and operational (social competence, including behaviours and attitudes)"*.

The scientific literature and consultancy reports foresee an increasing need for creative and inventive skills to facilitate inter-organisational innovation development in PSM and refer to "out-of-the-box thinking" (Deloitte, 2013; Fawcett & Rutner, 2014; KPMG, 2016; Nuntamanop, Kauranen, & Igel,

2013; Stek & Schiele, 2021). Deloitte (2013, p. 13) mentions *"thinking outside of the standard […] transformational box",* which aligns with identifying "holistic thinking" and "strategic thinking" as proposed by Bals, Schulze, Kelly, and Stek (2019) and Giunipero and Pearcy (2000). Moreover, the European education ministers concluded that institutions for higher education should foster "innovation and creativity" in society (Leuven/Louvain-la-Neuve Communiqué, 2009), which are associated with "holistic thinking" and "strategic thinking" in the above literature.

On the one hand, "critical thinking" and "analytical thinking" and on the other, "strategic thinking" and "holistic thinking" are forms of thinking but are not similar. Compared to "critical thinking"/"analytical thinking", "strategic thinking"/"holistic thinking" are higher-order forms of thinking. Interestingly, there is a discourse on different "thinking"-learning objectives in the literature. The discourse is led by Willingham (2008), who states: *"critical thinking (as well as scientific thinking and other domain-based thinking) is not a skill. There is not a set of critical thinking skills that can be acquired and deployed regardless of context"* (Willingham, 2008, p. 29). Hence, "thinking-learning" objectives need a meaningful context.

In education literature, "critical thinking"/"analytical thinking" is defined mainly with the upper three levels of Bloom's taxonomy of educational objectives, which are *"analysis", "synthesis",* and *"evaluation",* and in some cases, the following two levels are included: *"comprehension"* and *"application"* (Bloom, 1956; Ennis, 1993). Bloom's taxonomy subsequently recognises (1) (remembering) knowledge; (2) comprehension or understanding; (3) application; (4) analysis; (5) synthesis; and (6) evaluation and is often presented as a pyramid in which (remembering) knowledge forms the base of the pyramid and evaluation the tip (Bloom, 1956).

Nevertheless, this definition of "critical thinking"/"analytical thinking" based on Bloom's taxonomy is problematic (Ennis, 1993). Firstly, the levels of Bloom's taxonomy *"are not really hierarchical, as suggested by the theory, but rather are interdependent. For example, although synthesis and evaluation generally do require analysis, analysis generally requires synthesis and evaluation"* (Ennis, 1993, p. 179). A better definition of "critical thinking"/"analytical thinking" *"is the correct assessing of statements"* (Ennis, 1993, p. 179). The *"correct assessing of statements"* implies that "critical thinking" represents thinking within specific boundaries, i.e. "in-the-box thinking" and deviates from "out-of-the-box thinking".

"In-the-box" or "critical thinking"/"analytical thinking" is an intrapersonal, transferable skill with a solid cognitive basis within a limited context. *"Strategic thinking, in contrast, is about synthesis. It involves intuition and creativity. The outcome of strategic thinking is an integrated perspective of the enterprise, a not-too-precisely articulated vision of direction"* (Mintzberg, 1994, p. 3). Additionally, Nuntamanop et al. (2013, p. 242) found *"seven characteristics of strategic thinking that impacts strategy formulation, strategic actions, and business performance: conceptual thinking ability, visionary thinking, analytical thinking ability, synthesizing ability, objectivity, creativity, and learning ability. This set of abilities and skills is termed 'strategic thinking' competency".*

In conclusion, "in-the-box", "critical thinking", or "analytical thinking" forms a substantial part of the definition of "out-of-the-box" or "strategic thinking". "Critical thinking" consists mainly of analysing, synthesising, and evaluating and needs objectivity. "Strategic thinking" or "out-of-the-box thinking" builds further on the elements of "critical thinking" and requires creativity, conceptual and visionary thinking, and inventiveness. Interestingly, creativity and inventiveness lead to innovativeness, underlining the importance of *novel* and *useful* idea generation (Perry-Smith & Mannucci, 2017). Hence, *"innovation can be conceptualized as encompassing two different activities: the development of novel, useful ideas and their implementation"* (Baer, 2012, p. 1102). Therefore, "strategic thinking" is vital for the innovative capacity of an organisation and an evident valuable ability for graduates.

Thus, "creativity" is a necessity for "strategic thinking" (Mintzberg, 1994; Nuntamanop et al., 2013). In creativity research, there are two directions: *"everyday creativity (also called "little-c"), which can be found in nearly all people, and eminent creativity (also called "Big-C"), which is reserved for the great"* (Kaufman & Beghetto, 2009, p. 1). Examples of little-c given are: *"creative activities in which the average person may participate each day,"* such as *"coming up with a creative solution to a complex scheduling problem at work"* (Kaufman & Beghetto, 2009, p. 1) or active participation *"in innovation*

projects or heads cross-functional […] teams" (Kiratli, Rozemeijer, Hilken, de Ruyter, & de Jong, 2016, p. 202).

There is evidence that "creativity" and "strategic thinking" abilities can be developed within groups of academic students with creativity lectures, workshops and assignments (Stek, 2022). Students in different cohorts developed "strategic thinking" abilities, which appeared to align with the literature (Mintzberg, 1994; Nuntamanop et al., 2013).

However, it is unclear which type of students could benefit from the "creativity" education and could develop "strategic thinking" abilities. Secondly, it is unclear whether the hypothesis of Mintzberg (1994) and Nuntamanop et al. (2013) holds that "in-the-box" or "critical thinking added with "creativity" are the only necessary preconditions for "out-of-the-box" or "strategic thinking". Moreover, it is unclear which preconditions are sufficient to develop "out-of-the-box" or "strategic thinking". This leads to the following research questions:

- RQ1 – What personal skills and attitudes form analytical, creative and strategic thinking?
- RQ2 – How is the construct of analytical, creative and strategical thinking formed regarding sufficiency and necessity? Is analytical sufficient and necessary for creative and strategical thinking, and is creative thinking sufficient and necessary and strategical thinking?

2. Theory

2.1. The Bologna Process and the demand for personal skills

In the past decades, higher education's role in European societies has been redefined since European countries increasingly need to become knowledge-based societies (ESG Report, 2015). Higher education is essential in addressing the increasing demand for skills and competences to support social cohesion, economic growth and global competitiveness (ESG Report, 2015).

Therefore, the European Association of Institutions in Higher Education (EURASHE) and the European University Association (EUA) promoted and endorsed the shift towards student-centred methods. They co-developed the *standards and guidelines (ESG) for quality assurance in the European higher education area* (ESG Report, 2015). It states that:

> *"Institutions should ensure that the programmes are delivered in a way that encourages students to take an active role in creating the learning process and that the assessment of students reflects this approach (…) Student-centred learning and teaching plays an important role in stimulating students' motivation, self-reflection and engagement in the learning process"* (ESG Report, 2015, p. 12).

In parallel, European higher education systems have been harmonised in the Bologna Process (Bologna Declaration, 1999). In that process, the European universities agreed to "deliver" their graduates as *"active and responsible"* citizens to society, to provide them with *"creative and innovative"* knowledge, for which a shift from a teacher-centred towards a student-centred approach was decided (Leuven/Louvain-la-Neuve Communiqué, 2009). The communiqué assigns European higher education a role *"in realising a Europe of knowledge that is highly creative and innovative" and "fostering innovation and creativity in society"* (Leuven/Louvain-la-Neuve Communiqué, 2009, pp. 1-4).

Hence, higher education has an increasingly crucial role in addressing societal challenges and commits itself to student-centred education. Therefore, institutions of higher education need *"to facilitate their graduates being able to possess 1) knowledge, 2) professional and interpersonal skills, and 3) intrapersonal traits"* (Stek & Schiele, 2021, p. 12).

According to Bals et al. (2019), the competences needed to deal with the contemporary environmental, digital, and societal challenges should be *"fully integrated into higher and professional education and professional/industrial training programs".* Bals et al. (2019) propose student-centred didactics: *"such as role-plays and online courses and more interactive formats, e.g. blended learning or flipped classroom approaches".* Interestingly, transferable, intrapersonal traits, attitudes and characteristics *"the meta-oriented competence cluster reasoning presented in this study suggests that finding and training employees to develop and apply these kinds of competences might be the key to sustaining performance over time, under rapidly changing contextual factors"* (Bals et al., 2019, p. 11).

Chamorro-Premuzic, Arteche, Bremner, Greven, and Furnham (2010) report on how soft skills should be embedded in higher education. Extra-curricular soft skills programmes are not very effective for academic students. Instead, studying formal disciplines and academic knowledge can better develop these abilities. Therefore, soft skills development should be embedded within studying the discipline.

2.2. Barriers to student-centred approaches

Though student-centred approaches are preferred, especially for the training of personal skills, attitudes or traits (e.g. Bals et al., 2019), at (European) universities, the leading design is (1) teacher-centred, frontal, and classical lecturing for (2) 'transferring' knowledge and theory (Hoidn, 2017). Despite the intentions, several barriers caused the dominant approach in academia is still teacher centred. It is, moreover, primarily centred around knowledge and theory and lacks personal skills learning objectives regarding the development of interpersonal skills and intrapersonal traits and characteristics such as creativity and inventiveness (Birou, Lutz, & Zsidisin, 2016; Hoidn, 2017; Stinenbosch, 2017; Wong, Grant, Allan, & Jasiuvian, 2014).

Multiple barriers prevented higher education from shifting towards student-centred approaches. Firstly, since numerous students can attend a lecturer's class, teacher-centred methods are highly efficient but ineffective than student-centred methods (Hannafin & Land, 2000). However, it is doubtful if education can be *efficient* when *effectiveness* levels are lower. It is unlikely that a state of efficiency can be reached before effectiveness is established: "*Effectiveness is the foundation of success – efficiency is a minimum condition for survival after success has been achieved. Efficiency is concerned with doing things right. Effectiveness is doing the right things"* (Drucker, 1977, p. 33). Hence, in higher education, efficiency follows effectiveness too. The effectiveness of the individual student's learning process consists of the reconstruction of pieces of knowledge.

A second barrier is a profound change in the working modus, shifting from frontal, classical teaching towards student-centred didactics (Anthony & Kadir, 2012). The reason might be that the didactics developing personal skills differ significantly from professional skills (Laker & Powell, 2011). Traditional lecturers who are used to frontal, classical methods which modify their didactics into student-centred approaches state *"feelings of guilt"* because the student-centred method is *"just guiding and supporting the students in the learning processes".* Knowledge is no longer *"transferred"* in a classical mode (Anthony & Kadir, 2012, p. 57). The guilt is triggered by the erroneously anticipated loss of the lecturers' authority when leaving behind the frontal, classical method (Anthony & Kadir, 2012).

A third barrier is a preconceived perception of 'creativity' to overcome the myth of soft skills like "creativity" being a personal capacity that cannot be developed. Soft skills development, especially "creativity", requires a motivating environment to develop soft skills like "creativity" (Adams, Kaczmarczyk, Picton, & Demian, 2009).

Formalising personal skills learning objectives is further obstructed by the negative association lecturers in academia have. Chamorro-Premuzic et al. (2010, p. 238) found that *"IQ was negatively associated with soft skills ratings, such that individuals with higher cognitive ability were less likely to believe that soft skills were important for outstanding academic achievement or desirable job after graduating"*. Lecturers in academia wrongly believe that *"lower ability students may use soft skills to compensate for their poorer analytic/reasoning skills, just as conscientious students are more likely to use soft skills to improve their academic performance"* Chamorro-Premuzic et al. (2010, p. 238).

Additionally, the teaching and learning of personal skills are more complex. Laker and Powell (2011, p. 113) provided evidence that the personal skills learning process is associated with higher learner resistance levels. Often, personal skills are not as instantly applicable as professional skills training, resulting in a lower degree of realised proficiency and self-efficacy. Further, the preciseness of identifying personal skills training objectives is lower (Laker & Powell, 2011). The minor preciseness level could also apply to identifying training methods.

Hannafin and Land (2000) found that most higher education lecturers are convinced that their knowledge could be directly transmitted to individual students. Nevertheless, there is evidence that students have to reconstruct knowledge individually (Hannafin & Land, 2000). Students actively involved in an experiment for comprehensive learning showed better results than students who passively

watched a similar experiment demonstrated by a lecturer (Bonwell & Eison, 1991). The teacher-centred, frontal approach sets students in a passive, listening role, which has the lowest effect on retaining knowledge (Masters, 2013), for which Poh, Swenson, and Picard (2010) have provided empirical evidence.

3. Methodology - Quantitative data analyses – PLS-SEM and necessary condition analysis

The dataset was added with the outcomes of replicating the experiment with competence surveys at a business school in the Baltics (n=38). Applying SmartPLS 4, the total dataset (n = 70) was subject to structural equation modelling and necessary condition analysis. The final model with the "analytical thinking", "creativity", and "strategic thinking" constructs with the items from survey 2 (see: Table 1). The model is designed in such a way that the "analytical thinking" constructs are connected directly with the "strategic thinking" construct and indirectly via the "creativity" construct. This answers RQ1.

Initially, the constructs were formed with more items. However, items were removed to overcome low levels of the average variance explained (AVE) to ensure satisfying construct reliability and validity. Cronbach's alpha and the composite reliability (rho a) for the "creativity" construct are below but close to .7 (Field, 2009). The Fornell-Larcker criterion for discriminant validity is met (Henseler, Ringle, & Sarstedt, 2015). The collinearity statistic variance inflation factor (VIF) for the inner model of the three constructs is below 1.500, and for the outer model (i.e. the items of the constructs), below 2.000, which holds that multicollinearity is absent in the model (Field, 2009).

Table 1 – Constructs for the structural equation modelling

"Analytical thinking" construct	"Creativity" construct	"Strategic thinking" construct
Analytical thinking - Being able to analyse a problem and find a solution or to process and break down complex information Analytical thinking - I am excellent at breaking down facts and thoughts into their strengths and weaknesses." Analytical thinking - I am excellent at distinguishing between main and side issues Analytical thinking - I am excellent at thinking in a thoughtful, perceptive way, in solving problems, analysing data, and recalling and using information	Creativity - being creative in professional life / having creative ideas Creativity - I am an excellent example of a curious person who is willing to grow Creativity - I am an excellent example of a persisting, energetic and hard-working person Creativity - I am an excellent example of a self-disciplined, self-directed, and autonomous person	Strategic thinking - a mental or thinking process applied by an individual in the context of achieving a (set of) goal(s) Strategic Thinking - I am an excellent example of someone who is exploring and has a sense of discovery Strategic Thinking - I am an excellent example of a person with a sense of destiny for what is worthwhile to strive for Strategic Thinking - I am an excellent example of a person with a sense of direction who envisions a future dream

Necessary Condition Analysis has been performed to detect the necessary conditions. The necessary condition logic is that there will be *"no Y without X",* and in the sufficient condition logic ", *X* leads to *Y*" (Van der Valk, Sumo, Dul, & Schroeder, 2016, p. 267). Sufficiency logic leads to regressions in terms of $Y = a + b_1X_1 + b_2X_2 \ldots b_nX_n + \epsilon$. *"In this logic, each input (…) is sufficient to increase the outcome, but not necessary: A lack of an input reduces the outcome, but it will not prevent the outcome if other inputs (…) compensate for it"* (Hauff, Guerci, Dul, & van Rhee, 2019, p. 2).

The NCA leads to logic in terms of $Y = X_1 * X_2 * X_3 \ldots * X_n$. Hence, the effect of a value to be zero is more influential than in the regression-based methods. *"The dramatic sudden effect of zero values for necessary conditions fits many everyday experiences. A car stops moving if the fuel tank is empty; financial markets collapse if the trust is gone"* (Dul, 2016, p. 11). *"Thus, while a sufficient cause produces the outcome, a necessary cause allows the outcome to exist. Conversely, without the necessary cause, the outcome will not exist despite other factors being present"* (Van der Valk et al., 2016, p. 267).

Dul's (2022) manual was followed for analysing the necessary conditions using the NCA *R* package provided by Dul (2018a) and *R* Studio. The dependent variable was combined with the 36 independent variables. The NCA *R* package returns *p*-values and effect sizes. *"If the effect size is greater than zero, there is (…) an indication of the presence of a necessary condition. […] It ranges from 0 to 1 (0 ≤ d ≤ 1). The effect size indicates to what extent the condition is necessary for the outcome. In other words: to what extent the condition constrains the outcome, and the outcome is constrained by the condition"* (Dul, 2018b, p. 10).

Moreover, *"an effect size can be valued as important or not, depending on the context. A given effect size can be small in one context and large in another".* Although general qualifications for the effect size such as *"small," "medium,"* or *"large"* are disputable, a benchmark for necessary condition effect size is 0 < *d* < 0.1 as a *"small effect,"* 0.1 ≤ *d* < 0.3 as a *"medium effect,"* 0.3 ≤ *d* < 0.5 as a *"large effect,"* and *d* ≥ 0.5 as a *"very large effect"* (Dul, 2016, p. 30).

In the results, we present NCA bottleneck tables. Bottleneck tables are tabular representations of the NCA ceiling line. The first column is the dependent variable, and the subsequent columns are the independent variables and the necessary conditions. The values in the columns are levels of the independent and dependent variables corresponding to the ceiling line. The table reveals the particular level of the dependent variable, which particular threshold levels of the conditions for the independent variable are necessary.

4. Discussion of the structural equation modelling results based

Figure 1 shows the path coefficients along the lines and *R-squared adjusted* in the constructs "Creativity" and "Strategic thinking". As becomes clear from Table 2 is that the path from "analytical thinking" to "strategic thinking" is not significant. The paths from "analytical thinking" to "creativity" and from "creativity" to "strategic thinking" are significant. Table 3 shows a significant indirect effect of "analytical thinking" on "strategic thinking".

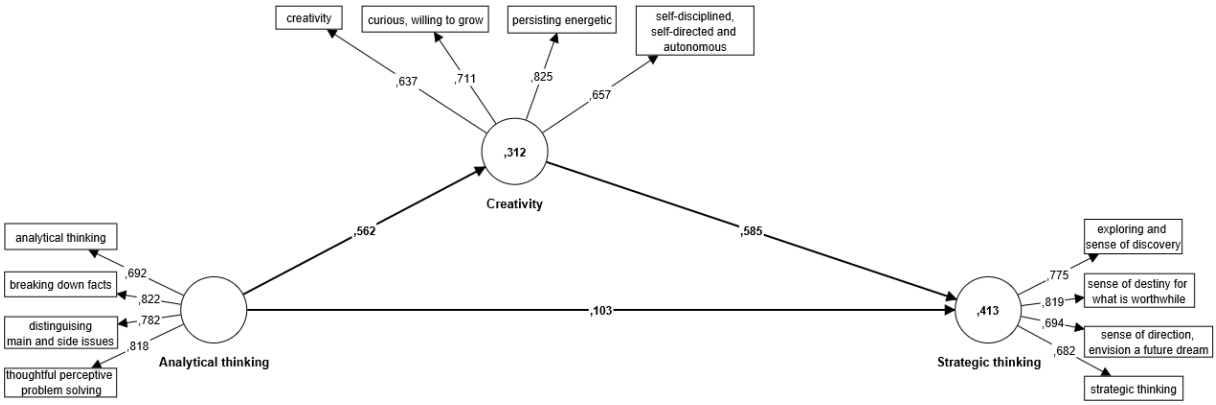

Figure 1 – Partially least squares (PLS) structural equation model (SEM)

Table 2 - PLS-SEM Results – total direct effects

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*p*-value
"Analytical thinking" -> "Creativity"	.562	.576	.087	6.444	.000
"Analytical thinking" -> "Strategic thinking"	.103	.094	.136	.758	.448
"Creativity" -> "Strategic thinking"	.585	.606	.114	5.149	.000

Table 3 - PLS-SEM Results – total indirect effects

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistic (|O/STDEV|)	*p*-value
"Analytical thinking" -> "Strategic thinking"	.329	.350	.091	3.613	.000

The NCA results are displayed in Table 4. Two analyses have been performed. Firstly, for "strategic thinking" with "analytical thinking" and "creativity" and for "creativity" with "analytical thinking". All tested relationships are significant with large effect sizes. Based on the guidelines of Richter, Schubring, Hauff, Ringle, and Sarstedt (2020), the outcomes of PLS-SEM and NCA in Tables 2 and 4 are combined and subject to further interpretation.

The path from "analytical thinking" to "strategic thinking" is non-significant, as shown in Table 2. However, "analytical thinking" is a significant necessary condition for "strategic thinking" (Table 4). Richter et al. (2020) guidelines include using bottleneck tables (see: Table 5). In this case, 93.0% of "analytical thinking" is necessary for "strategic thinking" to manifest. For an 80%-level of "strategic thinking", a 91.7%-level of "creativity" is necessary. A 90%-level of "creativity" requires an 83.4%-level of "analytic thinking" and 98.1% for a 100%-level of "creativity". Hence, the necessary conditional relationships within the construct are evident. The absence of "analytical thinking" prevents "creativity" and "strategic thinking" from manifesting, and without "creativity", there will be no "strategic thinking".

"Creativity" has a significant path towards "strategic thinking" and is a necessary condition. According to Richter et al. (2020), on average, an increase in the "creativity" construct will increase the "strategic thinking" outcome. However, 91,7% of the "creativity" construct is necessary for the outcome to manifest. A similar situation is found for the path from the "analytical thinking" construct towards "creativity". Increasing the "analytical thinking" construct will increase the "creativity" outcome. However, 98,1% of the "analytical thinking" construct is necessary for "creativity". Hence, large proportions of "analytical thinking" are necessary for "creativity" and "strategic thinking" and "creativity" are necessary for "strategic thinking".

The PLS-SEM NCA analyses answer RQ2 (*How is the construct of analytical, creative and strategical thinking formed in terms of sufficiency and necessity? Is analytical sufficient and necessary for creative and strategical thinking, and is creative thinking sufficient and necessary and strategical thinking?*). The items of the constructs "analytical thinking" are *problem analysis, problem solution and processing and breaking down complex information; breaking down facts and thoughts into their strengths and weaknesses; distinguishing between main and side issues;* and *thinking in a thoughtful, perceptive way, in solving problems, analysing data, and recalling and using information* (see: Table 1) (construct items based upon Amer, 2005). These items are necessary but not sufficient for "strategic thinking". However, they are necessary and sufficient for "creativity".

Table 4 - NCA results

	Original effect size	95.0%	Permutation *p*-value
"Analytical thinking" -> "Creativity"	.328	.258	.001
"Analytical thinking" -> "Strategic thinking"	.301	.288	.020
"Creativity" -> "Strategic thinking"	.295	.259	.007

Note: effect size is $0 < d < 0.1$ as a *"small effect,"* $0.1 \leq d < 0.3$ as a *"medium effect,"* $0.3 \leq d < 0.5$ as a *"large effect,"* and $d \geq 0.5$ as a *"very large effect"* (Dul, 2016, p. 30)

The items of the constructs "creativity" are *being creative in professional life and having creative ideas*; *I am an excellent example of a curious person who is willing to grow*; *being a persisting, energetic*

and hard-working person; and a self-disciplined, self-directed and autonomous person (construct items based upon Selby, Shaw, & Houtz, 2005). These items are necessary and sufficient for "strategic thinking" consisting of the items *Strategic thinking (a mental or thinking process applied by an individual in the context of achieving a (set of) goal(s)); someone who is exploring and has a sense of discovery; with a sense of destiny for what is worthwhile to strive for; and a sense of direction who envisions a future dream* (construct items based upon Liedtka, 1998).

Table 5 - Bottleneck tables - CE-FDH - Percentiles

"Strategic thinking"	"Analytical thinking"	"Creativity"
0%	NN	NN
10%	NN	NN
20%	NN	NN
30%	0.6	0.6
40%	1.9	2.5
50%	1.9	2.5
60%	3.2	2.5
70%	14.0	76.4
80%	83.4	91.7
90%	93.0	91.7
100%	93.0	91.7

"Creativity"	"Analytical thinking"
0%	0.6
10%	0.6
20%	0.6
30%	0.6
40%	0.6
50%	1.9
60%	1.9
70%	12.1
80%	23.6
90%	83.4
100%	98.1

5. Conclusion

5.1. Educational implications

The recommendation is to implement the creative approach in other academic courses. The precondition is that the student population needs to possess advanced "analytical thinking" skills, which is confirmed by Karwowski et al. (2016), who found that intelligence is a necessary precondition for developing "creativity". Therefore, students could benefit from their excellent analytical, in-the-box thinking abilities and become strategic, out-of-the-box thinkers. Introducing "creativity" is relatively complicated since it affects the alignment of learning objectives, didactics and assessment.

However, developing "strategic thinking" is relatively straightforward when the constructive alignment is solid. For suitable courses, lecturers could invite practitioners to introduce simple but wicked problems in line with the course's focus. Creating awareness with the students and colleagues would be the first step in shifting towards such an approach.

The future workforce needs creativity and strategic thinking abilities. Institutions for higher education are called by the European ministers of Education who declared that: "*Higher education should be based at all levels on the state of the art research and development, thus fostering innovation and creativity in society" (Leuven/Louvain-la-Neuve Communiqué, 2009, p. 4).* Hence, academia and higher education must anticipate future competences, especially personal skills. Therefore, the student-centred methods are promoted and endorsed by the European Association of Institutions in Higher Education (EURASHE) and the European University Association (EUA). They co-developed with the European ministers of education the *standards and guidelines (ESG) for quality assurance in the European higher education area* (ESG Report, 2015):

> *"Institutions should ensure that the programmes are delivered in a way that encourages students to take an active role in creating the learning process and that the assessment of students reflects this approach (…) Student-centred learning and teaching plays an important role in stimulating students' motivation, self-reflection and engagement in the learning process"* ESG Report (2015, p. 12).

5.2. Scientific implications

As far as known, this research is the first that quantified the necessary and sufficient relationships between "analytical thinking", "creativity", and "strategic thinking". The structural equation modelling (*n*=70) showed that "analytical thinking" is necessary for "creativity" and "strategic thinking", and "creativity" is necessary for "strategic thinking". Their absence prevents the outcome from manifesting. Hence, without "analytical thinking" and "creativity", "strategic thinking" development cannot exist.

The study showed that in the sufficiency logic, higher "analytical thinking" levels are needed for advanced "creativity" levels. Advanced "creativity" levels are needed for excellent "strategic thinking". A direct effect of "analytical thinking" on "strategic thinking" could not be found, but an indirect effect could. For the qualitative research, the students reflected on whether "analytical thinking" and "creativity" led, in their case, to "strategic thinking". About 80% of the students could support this, and the other 20% opposed or could not support it.

5.3. Limitations

Based on the outcomes of the first three cohorts, the question arose about the mechanisms of "strategic thinking" development. The 5ECTS course was given at UT in a timeframe of eight weeks. It could be replicated in Lithuania. However, the same study load was fitted in three weeks with a one-week break in between in Lithuania. Local case providers could be attracted via the alum network in Lithuania. Purchasing directors and consultants to elaborate on personal leadership, cultural awareness, consultancy skills, et cetera could not be attracted. The length and the content of the courses differed and might have led, together with the deviating student profiles, to other results.

A limitation of the study is how "analytical thinking", "creativity", and "strategic thinking" have been defined. These constructs are based on the extant literature, analysed for their validity and redefined with confirmative factor analyses. For instance, creative development is self-assessed by students, whereas creative ability tests most often assess the ability to think fluently in an original way. Others generally assess the subject. It is questionable whether precisely that could be measured during the experiment.

Another limitation is the quasi-experimental or pre-experimental character (Campbell & Stanley, 1966). Campbell and Stanley (1966) note that an O_1-X-O_2 design has internal validity problems primarily with '*history'. "Between O_1 and O_2, many other change-producing events may have occurred in addition to the experimenter's X"* (Campbell & Stanley, 1966, p. 6). In this study, a *one-group pre–test–post–test design* experiment is performed with cohorts of students in an elective, introductory PSM course. Parallel to the course, the participating students may have followed other courses that might have affected the second survey outcomes (O_2). The quasi-experiment was not controlled with a parallel group of students in a course that did not incorporate interpersonal skills and intrapersonal traits development. Moreover, some students acknowledged that they became aware of the competence level, which caused lower scores in the final survey, known as the Dunning-Kruger effect (Kruger & Dunning, 1999).

Further, the structural equation modelling is based on the survey of 70 students of an elective introduction course to PSM, which is a limited number. It is uncertain whether the results are generalisable for other populations. Next, some students sign out for different reasons after getting information about the course's first lecture. Hence, only interested students remained in the course after the introduction course, which may be seen as a respondent's bias and convenience sampling.

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