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## Development and application of the opportunity identification competence assessment test (OICAT) in higher education

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### ABSTRACT

Developing and assessing individuals' competence to identify business opportunities is of increasing importance in the current widespread introduction of entrepreneurship programmes in higher education worldwide. However, performance tests to assess opportunity identification competence (OIC) are scarce in the entrepreneurship education literature. This study elaborates on the development and application of such a performance assessment tool: the opportunity identification competence assessment test (OICAT). In the OICAT participants are asked to generate business ideas in the area of sustainable development. This study investigated how bachelor's students, and master's students following entrepreneurial courses, identify opportunities. The results suggest that the OICAT is successful in tracking individual differences in OIC. The OICAT could be used as a learning-oriented assessment, helping students find out both what they already can do and what they need for further improvement.

### KEYWORDS

Entrepreneurship education; performance assessment; opportunity identification; higher education; competence development

## Introduction

Entrepreneurship education (EE) in higher education is growing rapidly. An increasing number of universities offers entrepreneurship courses, and the topic is high on the political agenda (Fayolle, 2013). Students developing entrepreneurial competencies are prepared for complex careers full of entrepreneurial projects, characterised by opportunities, risk of failure, innovation and iterative experimentation (Lackéus, 2015). One of those entrepreneurial competencies is opportunity identification competence (OIC). Opportunity identification is at the heart of entrepreneurship research (Shane & Venkataraman, 2000), as the entrepreneurial process always starts with the identification of potential business ideas that could be explored and further developed into a new product, service or process (Baggen et al., 2015).

In the current study EE is broadly defined as the '[c]ontent, methods and activities that support the development of motivation, skill and experience, which make it possible to be

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entrepreneurial, to manage and participate in value-creating processes' (Moberg, Barslund Fosse, Hoffman, & Junge, 2014, p. 14). This definition captures not only the process of starting a new business but also the learning, change and value-creation processes involved in entrepreneurship (see the OECD report by Lackéus [2015] for detailed background on EE).

As EE is rather new in both practice and research, it still faces several challenges (Fayolle, 2013; Martin, McNally, & Kay, 2013). One of those challenges relates to the limited amount of research on assessment in EE. Several studies have measured OIC using various instruments, for instance self-assessments in which participants were asked to respond to items such as 'I have a special 'alertness' or sensitivity toward new venture opportunities' (Wang, Ellinger, & Wu, 2013, p. 257). However, how individuals judge their own behaviour can be different from their actual behaviour (Corbett, 2007). Other scholars (e.g. DeTienne & Chandler, 2004; Ucbasaran, Westhead, & Wright, 2009) asked participants to recall previously observed opportunities, which can be influenced by biases of recall and retrospection (Corbett, 2007). In sum, although these studies contribute significantly to our understanding of assessing OIC, scholars (e.g. Corbett, 2007; Grégoire, Shepherd, & Schurer Lambert, 2010; Shepherd & DeTienne, 2005) emphasise the limitations of these methods, arguing that these might not fully capture OIC because interviews and self-assessments measure perceptions, feelings and impressions, instead of actual behaviour.

Therefore authors (such as Grégoire et al., 2010) argue for the development of hypothetical exercises or performance tests to assess OIC – to measure the result of actual thinking and behaviour of individuals in this regard. Performance assessments have been developed to measure related skills such as creativity. For instance, in the Alternative Uses Task, participants are asked to think of all ways of using of a common item, such as a paperclip or a newspaper (Guilford, 1981). Such tasks provide insights into the 'real' efforts of participants and their creative capabilities, which is hard to capture using other techniques (Grégoire et al., 2010). However, for OIC – which addresses a more specific competence domain – such performance assessment has rarely been used. Yet, performance assessments are congruent with modern ways of thinking about assessment in education. There is a clear need for assessments that help students develop entrepreneurial competencies by offering concrete insight in and feedback on the test results (Lans & Gulikers, 2010), referred to as assessment *for* learning (Birenbaum et al., 2006).

The main aim of the present study was to develop a performance test that is able to measure individual's OIC and apply it in two university student samples. This performance test is referred to as the opportunity identification competence assessment test (OICAT). Below is an elaboration on earlier research on opportunities, followed by an explanation of the OICAT.

### Earlier research on opportunities

In entrepreneurship literature, different perspectives exist on what opportunities are and on the process underlying opportunity identification. Two main perspectives are the objective (i.e. discovery) and subjective (i.e. creation) perspective (Renko, Shrader, & Simon, 2012). Proponents of the objective view argue that opportunities can be discovered by alert individuals in the economic environment (Kirzner, 1997). Proponents of the subjective view maintain that opportunities are created by individuals (Fletcher, 2006; Wood & McKinley, 2010). In the discovery perspective, opportunities are determined by the environment,

whereas opportunities in the creation view are determined by the individual (Suddaby, Bruton, & Si, 2015; for a full elaboration on this debate please read Baggen et al., 2015 and Suddaby et al., 2015). These views are not mutually exclusive but they approach opportunities and the process underlying opportunity identification differently. As Dutta and Crossan (2005, p. 433) argue, one 'needs to be able to reconcile or even to synthesise the apparently conflicting positions of the two ontological approaches'. In this study, OIC is defined as 'the ability of individuals to identify ideas for new products, processes, practices or services in response to a particular pain, problem, or new market need' (Baggen et al., 2015, p. 417).

In line with other scholars (Lumpkin & Lichtenstein, 2005; Wood & McKinley, 2010) it is argued that an essential part of the opportunity identification process is *the generation of opportunity ideas*: initial ideas or envisioned futures in the mind of an individual. The nature of these ideas is closely related to the prior knowledge and experience of an individual (Arentz, Sautet, & Storr, 2013; Shane, 2000). Furthermore, idea generation is recognised as being a domain-specific form of creativity (Ucbasaran et al., 2009; Ward, 2004). Creative individuals are able to link relevant information and are sensitive to valuable, unique information. Creativity can help in coming up with a new opportunity, but creativity might be hindered by basic knowledge structures that constrain creative imagination (Ward, 2004).

## Methods

The OICAT is a performance assessment measuring business idea generation as an indicator for OIC; the ability of individuals to use their creativity and generate business ideas. To develop the OICAT in a systematic way, three steps have been taken. First, to ensure face-validity, a preliminary version of the OICAT was piloted among 130 Dutch master's students in social and natural sciences; this led to several improvements and amendments concerning the OICAT. Secondly, because of the explorative character of this study, the OICAT was further developed and applied in two distinct samples: students with and without a direct affinity with entrepreneurship. This yielded rich insight into the results the OICAT provides and whether or not the test generates different results over samples. Applying a newly-developed instrument among two different groups of respondents is more often done to test the robustness (i.e. the possibility to use the instrument across different groups) of an instrument (Khaled et al., 2014). For instance, Khaled and colleagues (2014) applied their instrument among students from vocational education and higher education. The OICAT was applied to Dutch master's students, referred to as Trial A. Then the OICAT was applied to Portuguese bachelor's students, referred to as Trial B. Thirdly, the results of the Trial A and Trial B samples were compared. In addition, to test for convergent validity of the OICAT against existing instruments, the results were compared to self-perceived OIC (see Introduction).

## Sample

The Dutch sample (Trial A) was a convenience sample of 115 master's students in the life sciences domain. The students took a course on career development and planning or a course on entrepreneurship in which they could orient themselves to an entrepreneurial career by actively exploring the first steps of the entrepreneurial process. The study programme of these students was related either to natural sciences (80.7%) or social sciences (19.3%). The average age was 23.5 years ( $SD = 1.97$ ). The majority (70.6%) were female. Trial

B was a convenience sample of 142 first-year Portuguese bachelor's students studying psychomotor rehabilitation (31.7%), dance (9.9%) or sport sciences (58.4%). The average age was 19.2 years ( $SD = 3.48$ ); 51.5% were female. At the moment of testing the students had just started their studies and did not take courses on entrepreneurship.

### Procedure

Tests were administered in class, with prior permission from the lecturer, in May 2014 in the Netherlands (Trial A) and September 2014 in Portugal (Trial B). After a short introduction, stressing the anonymity and confidentiality of data and explaining the procedure, the participants signed a declaration of consent and then began to work on the OICAT. Participants were warned when half of the time had passed and when they had only one minute left. After completing the OICAT, Trial A students completed a questionnaire including a scale for self-perceived OIC; due to time restrictions, Trial B students did not.

### Instrument development

The point of departure was an instrument applied by Corbett (2007) to measure business idea generation as an indicator for OIC. Corbett asked participants to generate business ideas related to technology. As technology-based entrepreneurship is a specific domain of entrepreneurship – it does not appeal to a diverse group of individuals (e.g. social sciences) – a broader topic was selected that is familiar to many people. This topic was sustainable development, of which the definition was derived from the knowledge platform on sustainable development of the United Nations (see <https://sustainabledevelopment.un.org/>): *[d]evelopment that meets the need of the present without compromising the ability of future generations to meet their own needs*. An explanation was provided what sustainable development is about and several specific examples were given, such as energy, climate change, and education. The participants were asked:

Imagine that you are asked to give input for business ideas for new start-ups in the area of sustainable development. These business ideas can concern people, planet and/or profit, and may lead to social, environmental and/or economic gains. What ideas for new start-ups come up in your mind?

A start-up was defined as a new independent venture or a new project within an organisation. Participants had 10 minutes to read the case and write down their business ideas.

Corbett (2007) analysed the number of generated ideas with the help of three expert raters. Other authors, such as DeTienne and Chandler (2004), used a 6-point scale to determine the innovativeness of ideas, ranging from '(1) No apparent innovation or not enough information to make a determination' to '(6) A new-to-the-world product/service, a pure invention or creation' (p. 253). However, it is a complex task to objectively score the generated ideas based on a 6-point scale. Therefore, in this study more objective criteria were used for the scoring of the ideas. Guilford (1967) developed a classification including three factors to score the creativity competence of individuals, namely fluency, elaboration, and flexibility. These three factors were used as starting point for scoring the generated ideas more objectively:

- (1) Guilford (1967) refers to *fluency* as the quantity of responses that fulfil the specifications as formulated in the question. The ideas were scored for 'comprehensibility' (1 = comprehensible, 0 = incomprehensible). For instance, '3-D printing' was too

vague to interpret in the context of sustainable development and as a start-up. Incomprehensible ideas were excluded from further analysis.

- (2) Originally, *elaboration* refers to the amount of detail in participant responses (Guilford, 1967). Because scoring elaborateness of business ideas appeared too ambiguous, ideas were scored for concreteness: the degree to which it was possible to visualise or apply the idea (1 = concrete, 0 = not concrete). The proportion of concrete ideas per participant was calculated: the percentage of comprehensible ideas that were concrete.
- (3) The *flexibility* score indicates to what degree participants generated ideas in different categories. For instance, the ideas 'use solar energy' and 'wear an extra sweater and turn down the heating' are both related to energy. The ideas 'use local products in the canteen' and 'reuse clothes' relate to different categories, indicating higher flexibility. The categories were based on the examples of sustainable development in the problem case (see Table 2 for an overview). Each idea was scored into one category. The formula for calculating the flexibility score was: number of scored categories / maximum number of categories (six).

The Trial A data were used to develop the codebook and to calculate the inter-rater reliability. The level of agreement was calculated for the dichotomous variables (comprehensibility and concreteness), and Cohen's kappa for flexibility. Two scholars from the team of authors scored 10% (about 75) of the ideas, which is an acceptable procedure for rating such a substantial data-set (Hallgren, 2012). They discussed their results, refined the codebook and repeated this procedure twice, until the measures of inter-rater reliability yielded acceptable levels: Cohen's kappa of .78, and agreement of 82.9% (concreteness) and 94.7% (comprehensibility). A 'miscellaneous' category was created for the ideas that did not align with the assignment at all. Subsequently, the first author scored the complete results of Trial A, and a student assistant speaking Dutch, English and Portuguese did the same for Trial B using the final codebook.

### **Measuring self-perceived opportunity identification competence**

A three-item scale previously applied by Wang et al. (2013) and Ozgen and Baron (2007) was used to measure self-perceived OIC in Trial A: 'Seeing potential opportunities does not come very naturally to me' (reverse scoring); 'I have a special alertness or sensitivity toward new opportunities' and 'While going about routine day-to-day activities, I see potential new venture ideas all around me'. The participants responded on a 5-point Likert scale. Internal consistency of the scale was determined by principal components analysis with varimax rotation. The test showed that the three items measured one single dimension (loadings ranged between .65 and .85). The Cronbach's alpha (.68) was calculated as an indication for the reliability of the scale. As Wang et al. (2013) found a Cronbach's alpha of .80 for the same scale, the lower Cronbach's alpha found in this study was accepted.

## **Results**

In Table 1, examples of generated ideas by the participants are provided, including how they were scored based on the developed codebook. Examples are presented for both the participants of Trial A and Trial B, and for each category participants could generate ideas in.

**Table 1.** Examples of the ideas generated by the participants from Trial A and Trial B in response to the OICAT.

Idea	Trial	Comprehensibility	Concreteness	Category
Management companies that help existing companies achieve sustainable goals	A	1	1	Education
Maximum use of waves and water movement for energy	B	1	1	Energy
Offer housing close to companies	A	1	1	Decent housing
A kind of challenge to separate waste	B	1	0	Climate change
Organic food production	A	1	0	Affordable and adequate food supply
Social support for employees, for example for pregnant women at work	B	1	1	Personal health and safety
Synthetic biology	A	0	n.a.	n.a.
Periodically checking housing	B	0	n.a.	n.a.

**Table 2.** Mean and standard deviation for OICAT (Trial A,  $N = 115$ ; Trial B,  $N = 142$ ).

	Trial A		Trial B	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
No. ideas generated	6.43	3.61	2.28	1.48
No. comprehensible ideas	6.25	3.53	2.24	1.44
No. concrete ideas	5.72	3.19	1.89	1.35
No. flexible ideas	3.14	1.08	1.70	.80
Categories				
Food	.87	1.07	.19	.43
Decent housing	.25	.58	.14	.38
Energy	1.12	1.29	.43	.74
Climate change	2.24	2.03	.85	.97
Education	1.39	1.44	.19	.51
Personal health and safety	.50	.84	.44	.73
Miscellaneous			.12	.42

The concrete ideas are visualisable or applicable, such as 'offering housing close to companies'. The not-concrete ideas are harder to apply without too much interpretation (such as 'organic food production').

Next, Table 2 shows descriptive statistics for the OICAT. The Trial A participants generated a higher number of ideas ( $M = 6.43$ ) compared to the Trial B participants ( $M = 2.28$ ). The relatively high standard deviations suggest variety in the responses of the participants. A high proportion of the comprehensible ideas, were also concrete (in Trial A: 92%; in Trial B: 84%). Participants from both trials generated most ideas in the category 'climate change' (Trial A:  $M = 2.24$ ; Trial B:  $M = .85$ ) and least ideas in the category 'decent housing' (Trial A:  $M = .25$ ; Trial B:  $M = .14$ ).

The descriptive statistics indicate that the Trial B participants scored lower on each criterion for OIC compared to the Trial A participants. Independent  $t$ -tests showed that these differences were significant: Trial B participants produced significantly less comprehensible ( $t = -11.45$ ,  $df = 145.2$ ,  $p < .001$ ) and concrete ( $t = -2.16$ ,  $df = 223.99$ ,  $p = .032$ ) ideas belonging to less categories ( $t = -11.77$ ,  $df = 201.12$ ,  $p < .001$ ) than did Trial A participants.

With respect to possible relationships between the OICAT and self-perceived OIC (tested only in Trial A), Kendall coefficients indicate insignificant relationships (all  $p > .05$ ), indicating that the instruments measure different outcomes.

## Discussion & conclusions

Because of limitations in existing self-assessment instruments, and the need for performance assessments in EE, the main aim of the current study was to develop and apply the OICAT in two university student samples. Two main conclusions can be drawn from our findings.

First, the master's students (Trial A) scored significantly higher than the bachelor's students on all aspects of the OICAT. The differences in comprehensibility, concreteness and flexibility suggest that the OICAT can be used to track individual differences in OIC. The participants from Corbett's (2007) study generated on average 3.79 ideas in 'a few minutes' (Corbett, 2007, p. 107). In comparison, the master's students in Trial A generated a relatively high number of ideas (6.25) – even though they had 10 min for the task. A possible explanation for this higher score is that they participated in entry courses in entrepreneurship. Moreover, as master's students in the life sciences they had considerable prior knowledge of sustainable development (as opposed to the Portuguese students). Prior knowledge plays a significant role in opportunity identification (Arentz et al., 2013; Shane, 2000).

Secondly, to examine the convergent validity of the OICAT, self-perceived OIC of the participants from Trial A was compared with the scores of the OICAT. No correlation was found. A possible explanation for this finding is that authors who used the scale (e.g. Ozgen & Baron, 2007; Wang et al., 2013) only refer to statistical criteria for its use, but not to external criteria such as a validation by experts (e.g. experienced, independent entrepreneurs). Therefore, it remains unclear whether the self-assessment truly correlates to opportunity identification.

### *Theoretical and practical implications*

No correlation was found between self-perceived OIC and OICAT. This result questions the effect-claims made in EE studies which use broad self-perceived measures of OIC. As such, the results of this study support the need expressed by researchers for more rigorous measures and designs in EE research (e.g. Martin et al., 2013; Shepherd & DeTienne, 2005). The results of this study suggest that OICAT could fulfil such need for performance measures in EE.

Practically, the OICAT may be used in higher education as a learning-oriented, formative assessment providing insight into the current OIC of students and whether or not it needs further development, allowing students to formulate personal, specific learning goals related to those aspects needing improvement (Birenbaum et al., 2006; Lans & Gulikers, 2010). Additionally, by reflecting on OICAT results with others (e.g. peers or teachers), students can improve their understanding of the crucial competencies needed in the early stages of entrepreneurship.

### *Limitations & directions for future research*

First, in terms of design regarding the OICAT, the 10 min to generate ideas may have resulted in the formulation of (too many) analytical as opposed to insightful answers (see for instance Salvi, Bricolo, Kounios, Bowden, & Beeman, 2016). In future research, participants could be given less time to generate ideas.

Secondly, in terms of analysing the results of the OICAT, the scoring of the ideas based on the criteria comprehensibility, concreteness, and flexibility could be extended in future

research. A large proportion of the comprehensible ideas were also concrete, and it would be interesting to find a more distinctive criterion for scoring the quality of the ideas. In the methods section, the 6-point scale to score the innovativeness of ideas as used by DeTienne and Chandler (2004) was mentioned as an example to gain insight into the quality of the ideas. Although it is rather difficult and a demanding, time-consuming task to objectively score the innovativeness of business ideas, it could be interesting to explore the scoring of ideas on their innovativeness as a way to get more grip on the quality of the generated ideas. Setting a clear procedure, including for instance the formulation of strict guidelines for the scoring of the ideas and the facilitation of intensive discussion between raters, would be recommendable when applying a scale with distinctive categories of innovativeness.

Third, though a self-assessment of OIC was used in the current study to investigate convergent validity of the OICAT, the data showed no correlation. To further explore convergent validity, it is important to investigate potential explaining variables behind OIC, such as prior knowledge, cognitive style or creativity (Shane, 2000; Ward, 2004). Furthermore, in future research the different outcomes of the OICAT and self-perceived OIC could be investigated. Apparently, both instruments provide different information and it would be interesting to further explore in what kind of research design it is most convenient to use which instrument.

Fourth, in the present study two samples differing in several aspects were used to test the OICAT. For instance, most of the participants were female (especially in Trial A: 70.6%) and the participants from the two trials differed in age (in Trial A the average age was 23.5 years and in Trial B the average age was 19.2 years). Including such diverse groups in the testing was valuable to examine whether the OICAT generates different results over groups. For future research different groups could be used to further examine the discriminant validity of the OICAT. For instance, because employees are increasingly expected to act entrepreneurial (Bosma et al., 2013), the OICAT could be applied among novice, serial or habitual entrepreneurs as well as employees working for existing companies. These different groups may score differently on the OICAT, as their cognitive framework for judging opportunities may be developed differently (Baron & Ensley, 2006).

In conclusion, some challenges should be addressed to further develop the instrument, such as proving its convergent validity. Nevertheless, the results of the current, explorative study are promising, as they suggest that the OICAT can be used to track individual differences in OIC, and that it seems to have the potential to be a useful instrument for both empirical research and practice.

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## Notes on contributors

**Yvette Baggen** has a background in educational sciences. Her PhD was part of the European funded LLLight'in'Europe research project at Wageningen University & Research at the Education and Competence Studies group. Yvette examined the relationships between opportunity identification competence of students and employees, organisational learning, and organisations' entrepreneurial performance. Currently, Yvette works for the department of Education at Utrecht University as a post-doc. Here, her research is mainly directed towards the topic learning in organisations.

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