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Evaluating entrepreneurial opportunities:

EXAMINING THE INITIAL RULE IMPORTANCE IN THE RULE-BASED REASONING FRAMEWORK

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EXECUTIVE SUMMARY

Entrepreneurship as a scholarly field seeks to understand how the opportunities to build future goods and services are discovered, created, and exploited, by whom, and with what consequences (Venkataraman, 1997). An important topic in entrepreneurship is the recognition and exploitation of opportunities (Eckhardt & Shane, 2003). Of all the stages in the opportunity identification process, the opportunity evaluation is the key to success (Hills, 1995). Better understandings of opportunity evaluations are therefore important, to increase the chances of success and survival of the firm (Baron, 2004).

To develop a better understanding of opportunity evaluations, this thesis has researched the initial evaluation rules of university students. Based on extant literature (Ardichvili, Cardozo, & Ray, 2003; Baron & Ensley, 2006), three relevant and important evaluation rules (Novelty, Resource Efficiency & Worst-case Scenario) were selected to be studied, which lead to the following two research questions: '*How important do individuals find each of the three evaluation rules for determining the opportunity attractiveness?'* and '*Do different individuals find different evaluation rules to be more important?'*. An opportunity evaluation framework was formed, utilizing the three evaluation rules and a rule-based reasoning technique (Chaiken, 1980; Williams & Wood, 2015), to assess the attractiveness of an entrepreneurial opportunity in a traditional conjoint experiment. Rank-ordered logistic regression analysis determined the following main results:

- Novelty: $\beta = 1.34$ and $p < 0.001$
- Resource Efficiency: $\beta = 2.07$ and $p < 0.001$
- Worst-case Scenario: $\beta = -1.94$ and $p < 0.001$

All three evaluation rules played an important role in determining the opportunity attractiveness, however not all evaluation rules had equal importance, as can been seen from the varying β-coefficients of the evaluation rules.

To check for differences in the sample and to answer the second research question four interaction variables were investigated, namely Education (technical vs. non-technical students), Entrepreneurial Experience (students without vs. with entrepreneurial experience), Gender (male vs. female) and Prior Knowledge (students without vs. with prior knowledge of the described entrepreneurial opportunity). Several interaction effects were found after the conjoint analysis:

- The relationship between Resource Efficiency and Opportunity Attractiveness became less positive when students did a non-technical study ($\beta = -0.68$ and $p < 0.05$).
- The relationship between Worst-case Scenario and Opportunity Attractiveness became less negative when students did a non-technical study ($\beta = 0.62$ and $p < 0.05$).
- The relationship between Resource Efficiency and Opportunity Attractiveness became less positive when students were female ($\beta = -0.69$ and $p < 0.05$)

- The relationship between Resource Efficiency and Opportunity Attractiveness became more positive when Prior Knowledge was higher (β = 0.32 and $p < 0.1$)

The results show differences between different university students do exist, yet only limitedly. Although the evaluation rules are heavily dependent on the individual's experiences and knowledge base (Baron & Ensley, 2006; Williams & Wood, 2015), which therefore leads to highly subjective opportunity evaluations, it did not result in very different Opportunity Attractiveness ratings.

Additionally, the evaluation framework has proven to be an useful tool to interpret and analyze an entrepreneurial opportunity, and to judge its attractiveness. The evaluation framework can also be helpful in exposing ones opportunity characteristic preferences. The preferences of novice and nascent entrepreneurs in the opportunity evaluation seem differ experienced entrepreneurs (Wood & Williams, 2014), with novice and nascent entrepreneurs potentially underestimating the importance and consequences of opportunity risks.

CONTENTS

1 INTRODUCTION

1.1 Background

Entrepreneurship as a scholarly field seeks to understand how the opportunities to build future goods and services are discovered, created, and exploited, by whom, and with what consequences (Venkataraman, 1997). Within this field identifying, selecting and executing the right opportunities for new ventures are one of the most important abilities of a successful entrepreneur (Stevenson & Gumpert, 1985). The successful discovery and development of opportunities are important for creating personal and societal wealth, and the prosperity of the firm (Baron, 2004).

The opportunity identification process, defined as the cognitive processes to perceive connections between seemingly unrelated events or trends in the external world, through which individuals and organizations conclude that they have identified an opportunity (Baron, 2006), has been researched to a great extent to try to understand how entrepreneurs 1) recognize, 2) evaluate, and 3) exploit opportunities (e.g. Ardichvili, Cardozo, & Ray, 2003; Gaglio & Katz, 2001; Keh, Foo, & Lim, 2002; Mitchell et al., 2002). Yet, whereas the opportunity recognition stage and the exploitation stage have received large scholarly attention over the years, the opportunity evaluation stage have remained relatively less well researched (Short, Ketchen, Shook, & Ireland, 2010; Wood & Mckelvie, 2015). Opportunity evaluations are defined as assessing the attractiveness for the firm of introducing new goods, services, or business models to one or more markets (Haynie, Shepherd, & McMullen, 2009). The opportunity evaluation is the key step in the opportunity identification process (Hills, 1995) and should be receiving considerable attention, since the entrepreneurial opportunity has inherently high risks, requires considerable time, effort and resources for its exploitation, and has a large impact on the firm (Papadakis, Lioukas, & Chambers, 1998). Hence understanding opportunity evaluations represent a core intellectual question for the domain of Entrepreneurship (Eckhardt & Shane, 2003).

Research on entrepreneurial opportunity evaluations has found some factors affecting the opportunity evaluations, such as opportunity-related knowledge (Mitchell & Shepherd, 2010), market knowledge (Grégoire & Shepherd, 2012), entrepreneurial experience (Ucbasaran, Westhead, Wright, & Flores, 2010), opportunity relatedness to existing knowledge, skills and abilities (Haynie et al., 2009), emotions (Foo, 2011), and risk perception (Keh et al., 2002), but the research has mainly been fragmented. Since the entrepreneurial opportunity is most often found in an environment with high uncertainty, where information is ambiguous, risks are high and consequences large (Baron, 1998), entrepreneurs can benefit from a structured way to evaluate the opportunities to cope with these difficult circumstances (Dimov, 2010).

In uncertain circumstances cognitive science research suggests decisions can be driven by rule-based reasoning (E. E. Smith & Sloman, 1994). Rule-based reasoning is the use of cognitive

normative decision rules to process information from the environment and give it form and meaning (Hastie, 2001). In other words, based on personal experience and knowledge, decision rules are created that allow the use of logic and causal inference to judge a situation and determine an appropriate response (Chaiken, 1980). An example of such a decision rule is: if you want to invest some capital, and if return-on-investment is above a certain threshold, then you can proceed. Used in a framework, in the form of a set of decision rules, it can be utilized to interpret ideas and circumstances in a structured, critical and reflective way (Dimov, 2007), and can function as a useful tool for evaluating opportunities (Wood & Williams, 2014).

Rule-based reasoning relies heavily on the experience and knowledge of the decision-maker and thus differences between individuals, such as differences in knowledge base or decision-making styles, result in different decision rules and rule content. As the decision-maker's experience in and knowledge of opportunity evaluations increases, the evaluation rules change, expand and get refined over time (Baron & Ensley, 2006).

While research has been done on how experienced entrepreneurs use rule-based reasoning to evaluate opportunities (e.g. Baron & Ensley, 2006; Wood & Williams, 2014), the starting point, the initial evaluation framework of individuals, still remains largely unknown and is likely to be different from experienced entrepreneurs. How do individuals with no or limited entrepreneurial experience evaluate an entrepreneurial opportunity if they have never or rarely done it before? Some evaluation rules are necessary to be able to evaluate the recognized entrepreneurial opportunity, to judge its desirability and feasibility. Building a knowledge base is therefore crucial for the development of specific decision rules to make effective opportunity evaluations. By researching the initial evaluation framework, this study will provide new information and insights which can then be used to prevent evaluation biases and novice pitfalls (Baron & Ensley, 2006), and which can also point out what specific information and knowledge can be useful to further develop one's opportunity evaluation framework in order to increase the chances of selecting the right entrepreneurial opportunity to exploit.

The goal of this thesis is to study which individuals value which evaluation rules to evaluate entrepreneurial opportunities. By focusing on University of Twente students with no or limited entrepreneurial experience, this thesis aims to develop a better understanding of the initial evaluation rules. Students from the University of Twente are an interesting sample not only because higher education can lead to an entrepreneurial mindset despite not having any actual entrepreneurial experience (Costa, Ehrenhard, Caetano, & Santos, 2016), but also because University of Twente is the most entrepreneurial university in the Netherlands ("UT again voted most", 2015) with commercial knowledge transfer as one of its core tasks, making its students potential entrepreneurs.

This thesis will examine three theory-based evaluation rules: Novelty, Resource Efficiency, and Worst-case Scenario. The results will show the importance given to each evaluation rule for judging the opportunity attractiveness. Additionally, extant literature suggests differences in decision-

making between technical and non-technical students (Gustafsson, 2006) which can affect how opportunities are evaluated, thus valuing the evaluation rules differently. This potential difference will be verified. Furthermore, students without any entrepreneurial experience as well as students with (limited) entrepreneurial experience participated in this study. More entrepreneurial experience leads to a higher focus on actually starting and running a new venture, such as focusing more on a manageable risk (Baron & Ensley, 2006). This suggest differences between students with some entrepreneurial experience and students without. This too will be tested.

Whereas previous studies have primarily relied on retrospective data, analyzing evaluations from the past, this study will use a traditional conjoint experiment instead. First of all because the university students have non or limited relevant experience yet that can be analyzed. Secondly, to overcome the problems with and potential biases in using retrospective data. Third and finally, to be able to determine the utility coefficients of the three independent variables, the potential interaction effects, and the potential moderating effects of education and prior entrepreneurial experience.

1.2 Main research question

This study will look into the initial entrepreneurial opportunity evaluation framework, based on research by Wood & Williams (2014), consisting of the three evaluation rules: Novelty, Resource Efficiency and Worst-case Scenario, and will specifically answer the following research questions:

1. *How important do individuals find each of the three evaluation rules for determining the opportunity attractiveness?*

2. *Do different individuals find different evaluation rules to be more important?*

Seven hypotheses are formed based on extant literature and their outcomes provide the necessary information to answer these research questions. The first three hypotheses test the three evaluation rules. The fourth hypothesis examines the interaction effect of Worst-case Scenario on the other two rules. The other three hypotheses focus on other interaction effects to look into differences between groups of individuals, namely the fifth hypothesis, with Education as an interaction effect, testing differences between technical and non-technical students, and then the sixth and seventh hypothesis assess differences between individuals with and without previous entrepreneurial experience.

1.3 Scope

First of all, this study is limited to entrepreneurial opportunities. The entrepreneurial opportunities are distinct in their features from other kinds of opportunities, such as strategic opportunities (e.g. taking over a competitor or supplier). The entrepreneurial opportunities are inherently uncertain, whereas strategic opportunities usually have known risks and returns, and this leads to different evaluation rules in the opportunity evaluation framework (Denrell, Fang, & Winter, 2003; Papadakis et al., 1998).

Furthermore, within the class of entrepreneurial opportunities, this study focuses on the recognized and discovered opportunities (Gustafsson, 2006). Recent entrepreneurship literature has developed different epistemological perspectives for the concept of opportunities. Entrepreneurial opportunities are heterogeneous in their nature, such as in their level of uncertainty (Sarasvathy, Dew, Velamuri, & Venkataraman, 2003). Based on three levels of uncertainty, ranging from low to high uncertainty (Knight, 1921), an entrepreneurial opportunity can then be categorized in three perspectives respectively (Sarasvathy et al. 2003):

1. *Opportunity Recognition*: supply and demand exist. The match-up has to be recognized.
2. *Opportunity Discovery*: only one side exists, either supply or demand. The non-existent side has to be discovered.
3. *Opportunity Creation*: neither side exist and both have to be created.

The level of uncertainty has consequences for which type of decision-making yields the best results. High uncertainty leads to the use of intuition or heuristics, moderate uncertainty induces quasi-rational decision-making and in low uncertainty rational, analytical decision-making gives the best results (Gustafsson, 2006). Since this study will research an analytical decision-making technique which for its functioning needs some information on the to-judge opportunity characteristics, this study will therefore focus on the low and moderate uncertainty situations, and thus the recognized and discovered entrepreneurial opportunities.

Next, this evaluation framework is oriented towards entrepreneurs, i.e. individuals that demonstrate the competitive behaviors that drive the market process (Davidsson, 2004), and his/her set of decision rules. The entrepreneur has a large personal influence on the opportunity evaluation, a specific subjective perception of the risks and makes the final decisions largely on its own (Eisenhardt & Bourgeois, 1988), which leads to an distinctive set of evaluation rules.

Finally, this study will be limited to three evaluation rules (Novelty, Resource Efficiency, and Worst-case Scenario) due to the time constraints of this thesis. Also not fewer rules, to give enough substance to this thesis and to allow for some comparison with the original study by Wood & Williams (2014).

1.4 Relevance

This study aims to make a contribution to the cognitive theory of entrepreneurial opportunity evaluations, the understanding of rule-based reasoning as an evaluation framework of entrepreneurial opportunities, and the influences on those evaluations. The results can provide relevant information on the initial opportunity mental images of individuals with no and limited entrepreneurial experience and can support the development of this recently developed evaluation framework.

In general, there is still little known about the opportunity evaluations of individuals with no or limited entrepreneurial experience, since existing research has primarily focused on experienced entrepreneurs (Bishop & Nixon, 2006). Using university students as a sample, this study will provide base rate information on opportunity evaluations, by researching how much they value each evaluation rule.

The findings from this study can be used to teach and support nascent and novice entrepreneurs in making better opportunity evaluations, help individuals develop specific and relevant evaluation rules, and point out possible evaluation biases or myopias. In the opportunity identification process, the opportunity evaluation is the key to success (Hills 1995), thus making better opportunity evaluations will increase the chances of success and survival of the firm (Azoulay & Shane, 2001).

Entrepreneurial opportunities are heterogeneous and their evaluations occur infrequently, making the learning process in opportunity evaluations difficult (Bingham & Eisenhardt, 2005). Knowledge of the initial evaluation framework can be used to improve and accelerate the learning process to increase the evaluation effectiveness. Additionally, the findings can help entrepreneurship educators better understand how nascent and novice entrepreneurs evaluate entrepreneurial opportunities. Knowing how individuals with no or limited entrepreneurial experience think can then be used to improve education programs and the training of relevant competences, to change the novice mindset to that of an expert entrepreneur (Krueger, 2007).

The findings can also provide insights on the attitude of students towards entrepreneurship and supply the University of Twente and the related incubator program with ideas to improve their Entrepreneurship programs and education, increase entrepreneurial awareness and perhaps even stimulate entrepreneurship among its students, since university students can be regarded as potential entrepreneurs (Block, Hoogerheide, & Thurik, 2011; Costa, Santos, & Caetano, 2013).

2 LITERATURE REVIEW

2.1 Opportunity identification process

Entrepreneurs are the individuals that demonstrate the competitive behaviors that drive the market process (Davidsson, 2004). One of their most important tasks is to discover and develop business opportunities, for short term success and long term survival of the firm (Baron, 2004). These entrepreneurial opportunities consists of a set of ideas, beliefs and actions that enable the creation of new means-end relationships (i.e. future goods and services) in the absence of current markets for them (Venkataraman, 1997), and a perceived means of generating customer value and profit that previously has not been exploited (Baron, 2006).

Entrepreneurs are highly adept at the process of recognizing and pursuing opportunities, using their knowledge and cognitive skills to identify promising opportunities (Shane, 2000). The process of opportunity identification is defined as the cognitive processes to perceive connections between seemingly unrelated events or trends in the external world, and through which individuals and organizations conclude that they have identified an opportunity (Baron, 2006). The opportunity identification process generally consists of the following linked, but distinct, sequence of 5 stages (Ardichvili et al., 2003; Baron, 2006; Tumasjan, Welpe, & Spörrle, 2013):

1. *Opportunity*: the unformed beginning, e.g. changes in the external world, imprecisely-defined market needs, or un- or under-employed resources or capabilities.
2. *Opportunity Development*: the elemental idea becomes more elaborate, and a potential business idea begins to emerge.
3. *Opportunity Recognition*: the perception, discovery or creation of opportunities; turning the idea into a business concept.
4. *Opportunity Evaluation*: the business concept, the financial planning, and resource requirements are combined into a full business model. The analysis determines if value and profit can be delivered.
5. *Opportunity Exploitation*: if all steps are judged positively, the opportunity will be exploited and a new business will be formed.

The opportunity identification process is a highly important ability of the entrepreneur because the outcomes are usually big, risky and hard to reverse, having substantial long-term effects (Papadakis et al., 1998), yet difficult since these decisions are infrequent, non-routine, and heterogeneous (Eisenhardt & Zbaracki, 1992). Since opportunity identification is such an important but difficult task, much has been written about it. For example research on various aspects of the opportunity identification process, such as the role of prior knowledge and experience (Shane, 2000), the role of social networks (Hills, Lumpkin, & Singh, 1997), market inefficiencies (Denrell et al., 2003) and personality traits (De Carolis & Saparito, 2006). Scholars have also been

researching mediators of opportunity-related processes; studies on the risks and uncertainty in the opportunity identification process (Miller, 2007), and on cognitive biases lowering the risk perception or risk-taking propensity by entrepreneurs (Simon, Houghton, & Aquino, 2000). Research into moderator variables found several effects as well, such as the influences of cognitive structures. Examples are entrepreneurial alertness (Gaglio & Katz, 2001), counterfactual thinking (Gaglio, 2004), perception of opportunities (Keh et al., 2002), cognitive processes impacting recognition (Krueger, 2000), and pattern recognition (Baron, 2006).

However, research specifically on the opportunity evaluation stage lags behind the other stages of opportunity identification process (i.e. recognition and exploitation) (Short et al., 2010; Wood & Mckelvie, 2015), despite researchers arguing that opportunity evaluation is one of the most important abilities of successful entrepreneurs (Mitchell & Shepherd, 2010) and believing that opportunity evaluations represents a core topic in the field of Entrepreneurship (Eckhardt & Shane, 2003).

2.2 Opportunity evaluation

Opportunity evaluation is defined as assessing the attractiveness for the firm of introducing new goods, services, or business models to one or more markets (Haynie et al., 2009). It is an activity whereby ambiguity is reduced through increasingly defining the circumstances and events so that they are seen (or not) as an attractive possible future (Dimov, 2010; Shepherd, McMullen, & Jennings, 2007). In other words, the elemental idea or market change has been fully developed into a business concept, and together with the financial planning and the resource requirements transformed into a full-blown business model for a new business (Ardichvili et al., 2003). The business model is then scrutinized, meaning making future-oriented judgments where ambiguous events, outcomes, and consequences are inferred to determine the final attractiveness of an opportunity (Hastie, 2001).

The entrepreneurial opportunity is most often found in an environment characterized by high levels of ambiguity, uncertainty, novelty, emotion and time pressure (Baron, 1998; Grégoire, Shepherd, & Schurer Lambert, 2010). These conditions make the transformation of an elemental idea into a new venture a complex and difficult exercise. Within this transformation process, most entrepreneurs agree that the opportunity evaluation is the key to success (Hills, 1995). Selecting the right opportunity for you specifically can ensure the survival, growth and prosperity of the firm, personal and societal wealth (Baron, 2004) and create and deliver value for the stakeholders in the prospective venture (Ardichvili et al., 2003). Entrepreneurs can therefore benefit from a structured way to evaluate the opportunities (Dimov, 2010).

Although extant literature does recognize the difficult circumstances surrounding the opportunity, it does not provide any structured way to perform opportunity evaluations (Wood & Williams, 2014). Current research on opportunity evaluations has mostly been fragmented and

limited to fine-grained analyses of specific variable effects on the evaluations. The development an overarching evaluation framework will be useful to better understand how entrepreneurs actually evaluate entrepreneurial opportunities, to structure the decision-making process, and to uncover which decisions lead to success and which do not. Research from the cognitive science field argues that in complex and uncertain circumstances the decisions can be driven by rule-based reasoning as a way to structure decision problems and guide judgments (E. E. Smith & Sloman, 1994).

2.3 Rule-based reasoning

Rule-based reasoning is the development and application of normative decision rules, based on personal experience and knowledge, allowing for the use of logic and causal inference to judge a situation and to determine an appropriate response (Chaiken, 1980; Sloman, 1996). This decision-making technique uses cognitive knowledge structures (the decision rules) to systematically organize information, frame decision problems, guide judgement, drive solutions, and determine the value and consequences of action, through mental simulations of cause and effect relationships (Williams & Wood, 2015). The normative decision rules have the following form

if s_1, then if a_1, then c_1

where *s* represents a setting condition, *a* represents an antecedent, and *c* is a consequent (Autio, Dahlander, & Frederiksen, 2013; Frye, Zelazo, & Palfai, 1995). An example of a decision rule: a potential opportunity must meet a specific financial return threshold depending on the expected time needed to develop it. A cognitive relationship of the time needed to develop the potential opportunity and the minimum financial return is made and when the considered opportunity does not meet the threshold the opportunity is not worthwhile and not pursued further.

Decision rules can be inferences about anticipated future occurrences, derived from knowledge that is structurally similar to current circumstances but not directly related to the specific event or situation at hand (Abelson, 1981), or expectancies about the hierarchical order, direction, and magnitude of future outcomes determined using expert knowledge related to the opportunity (Larrick, Nisbett, & Morgan, 1993).

Entrepreneurial opportunities can be seen as multidimensional constructs (Baron & Ensley, 2006) and its evaluation relies on the assessment of the value of the different characteristics (Dimov, 2007, 2010). A set of decision rules, i.e. knowledge-based framework, can be applied to interpret ideas and circumstances in a structured, multidimensional and critical way (Dimov, 2007). Thus such a framework can be helpful to be able to interpret an entrepreneurial opportunity despite its uncertain and ambiguous environment, to analyze the opportunity in a structured manner and to make estimates about its value and likely future (Barreto, 2012; March, 1994).

2.4 Evaluation framework

An evaluation framework is a set of opportunity-specific, relevant normative rules and rule content, used to judge an opportunity on several characteristics to determine the overall attractiveness (Williams & Wood, 2015). An entrepreneurial opportunity evokes knowledge on opportunity-specific attributes and then stimulates specific, subjective decision rules and rule content, leading to an idiosyncratic framework for each opportunity.

When performing an opportunity evaluation, the decision-maker receives or collects informational cues on the circumstances or events. These cues define the mental image of the considered opportunity and evoke the mental image of the personal ideal opportunity, which was developed over time. Next, an evaluation framework is activated by the cues and used to cognitively compare the degree to which an image of a potential opportunity matches with the knowledge-driven image of an ideal opportunity (E. R. Smith & DeCoster, 2000; Van Overwalle, 2009). This will result in a certain degree of personal attractiveness and subsequently in the decision whether an opportunity is worthy to exploit or not.

Rule-based reasoning relies heavily on the experience and knowledge of the decision-maker, with as a result that one single opportunity can be evaluated rather differently by different people (Shane 2000a). Still commonalities in the evaluation frameworks of different individuals exist. For example ten common dimensions have been found by Baron and Ensley (2006) to be important in classifying and judging an opportunity: 1) solves customers' problems, 2) positive net cash flow, 3) manageable risk, 4) superior product, 5) changes industry, 6) overall financial model, 7) advice from experts, 8) unique product, 9) big potential market, and 10) intuition. Also, general supply and demand relations are considered (Venkataraman & Sarasvathy, 2001), such as the availability of resources (Ardichvili et al., 2003) or the window of opportunity (J. R. Mitchell & Shepherd, 2010).

This study focuses on three opportunity dimensions to determine the opportunity attractiveness: unique product, resources and manageable risk. These three dimensions are chosen since they are found to play a significant role in determining the opportunity attractiveness (Baron & Ensley, 2006; Shane, 2000, 2003), are uncorrelated but together form a realistic combination of characteristics for judging an opportunity. Additionally, these dimensions are directly observable, do not require comparisons with another product or service (unlike a 'superior product' dimension for instance), do not need specific prior market knowledge (as is required for 'changes industry'), and can be understood at once from the scenario information. The three opportunity dimensions are operationalized in following three evaluation rules respectively: Novelty, Resource Efficiency and Worst-case Scenario.

2.5 Hypotheses development

Seven hypotheses are developed in order to investigate the opportunity evaluations, in other words the influences on Opportunity Attractiveness. The first three hypotheses focus on the importance (utility) of each evaluation rule and the other four hypotheses analyze interaction effects. Figure 1 outlines the variables and hypothesized relationships in a conceptual model.

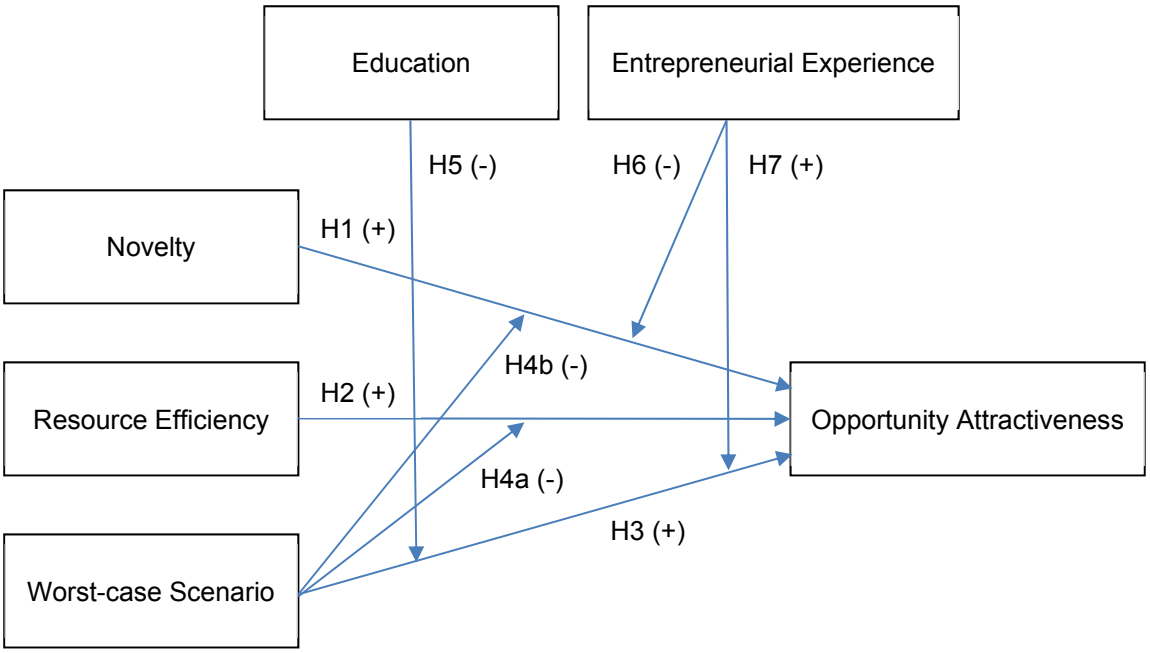

Figure 1. The conceptual model with the hypotheses

Novelty. A new, innovative, rare or unique means-end relationship (Shane, 2003). Novelty means giving consumers something new, original or different which increases the potential value of the opportunity (Choi & Shepherd, 2004), it differentiates the offerings of the firm from the competition (Porter, 1980), it offers first-mover advantages and a competitive advantage (Lieberman & Montgomery, 1988), and it is therefore generally considered as desirable. Furthermore, a more novel product of service results in greater risks but also greater potential rewards (Foo, 2011), thus making it more desirable. These consequences suggest that a more novel opportunity has greater value and therefore higher attractiveness, leading to the following hypothesis:

Hypothesis 1: When Novelty is high rather than low, the opportunity is evaluated as more attractive.

Resource Efficiency. The deployment of the firms resources to their best use, especially when resources are restrained. An important task of the entrepreneur is to direct resources to a certain process rather than to others, seeking optimal productive deployment (Kirzner, 1979; Shane, 2003). This then will result in higher returns and higher firm performance (Penrose, 1959), and a competitive advantage (Hanlon & Saunders, 2007). The optimal deployment of resources is called Resource Efficiency and defined as applying resources to their 'first and best use'. The decision to exploit a new opportunity can arise when the financial returns from new resource deployments are predicted to be better than the returns from the current deployment of resources (Thornberry, 2001). The attractiveness of an opportunity is thus likely to be higher when Resource Efficiency is higher, which in turn suggests the second hypothesis:

> *Hypothesis 2: When Resource Efficiency is high rather than low, the opportunity is evaluated as more attractive.*

Worst-case scenario. Asking yourself 'What is the worst that can happen?' when an opportunity is exploited, to assess the risks and ambiguity associated with the opportunity (Bryant, 2007). Entrepreneurial opportunities are inherently risky (Baron, 1998), highly heterogeneous and the related risks vary per opportunity (McKelvie, Haynie, & Gustavsson, 2011). Individuals have a greater sensitivity to losses than to equivalent gains when making decisions (Kahneman & Tversky, 1984), which leads to tendency to avoid losses. In entrepreneurship, most entrepreneurs would 'rather miss than sink the boat' when deciding to pursue an opportunity (Mullins & Forlani, 2005), making relatively risk-averse choices. Therefore it is expected that high risk (and thus high potential losses) will be evaluated as less attractive. This leads to the next hypothesis:

> *Hypothesis 3: When the magnitude of the Worst-case Scenario is conceptualized as mild rather than severe, the opportunity is evaluated as more attractive.*

Interactions. The assessment of the Worst-case Scenario usually follows evaluations of strategies and markets (Bryant, 2007), and could then impact the effects of other opportunity evaluation rules, such as the relationships of Novelty (H1) and Resource Efficiency (H2) with the Opportunity Attractiveness. An opportunity with an severe Worst-case Scenario, having a high chance of disappointing results, can lead to an anticipated sense of fear (Grichnik, Smeja, & Welpe, 2010), regret (Baron, 1998), doubt and of high opportunity costs (Shepherd et al., 2007). So when the Worst-case Scenario is severe, the entrepreneur may lose faith in the opportunity and as a result the effects of other evaluation rules may be weakened, thus moderating the relationship between other rules and the attractiveness. This suggests the following:

Hypothesis 4a: The positive relationship between Resource Efficiency and Opportunity Attractiveness is less positive when the worst-case scenario is severe rather than mild.

Hypothesis 4b: The positive relationship between Novelty and Opportunity Attractiveness is less positive when the worst-case scenario is severe rather than mild.

Education. Previous research has found that education plays an important role in opportunity identification process (e.g. Arenius & Clercq, 2005; Cliff, Jennings, & Greenwood, 2006). In general, the greater the human capital the better the performance is in a certain task (Becker, 1975). In the opportunity identification process, a broader skill set and knowledge base has a positive effect on the ability to recognize and evaluate opportunities (Haynie et al., 2009; Shane, 2000; Wood & Williams, 2014). Not only the amount but also the type of education is a relevant factor. Differences in the type of education lead to the development of different cognitive models and different knowledge bases (Hambrick & Mason, 1984), which could influence the evaluation rules and subsequent decision-making. For example, business education leads to business students being more prone to analytical decision-making (Gustafsson, 2006), business education makes business students evaluate entrepreneurial opportunities more vigorously (Kuckertz & Wagner, 2010), and their analytic techniques are largely focused on avoiding losses or mistakes (Hambrick & Mason, 1984). Based on these aforementioned studies, the non-technical students are expected to fear risk more and will therefore more negatively value the Worst-case Scenario. This leads to a fifth hypothesis:

Hypothesis 5: Non-technical education moderates the relationship between Worst-case Scenario and Opportunity Attractiveness in such a way that the negative relationship is more negative when individuals follow a non-technical study.

Entrepreneurial experience. With rule-based reasoning, the experience and knowledge of the decision-maker determines for a large extent which evaluation rules are used for the considered opportunity and what rule content is applied (Shane, 2000; Wood & Williams, 2014). Differences in the knowledge base result in the use of different decision rules and rule content. As the decision-maker's experience and knowledge increases, the evaluation rules change, expand and get refined over time (Baron & Ensley, 2006), leading to differences between novice and experienced entrepreneurs. A cause of these differences is that as individuals gain experience in a certain domain their opportunity prototypes become increasingly focused on key attributes of that domain (Matlin, 2005). When evaluating an opportunity, novice entrepreneurs focus on how novel an idea is, but experienced entrepreneurs focus more on factors related to actually starting and running a new venture (Baron & Ensley, 2006). These findings suggests that the importance of Novelty

decreases as the entrepreneurial experience increases. Consequently the following is hypothesized:

Hypothesis 6: Entrepreneurial experience moderates the relationship between the Novelty and Opportunity Attractiveness such that the positive relationship is less positive when individuals have entrepreneurial experience.

Entrepreneurial opportunities have substantial risks, but potentially high rewards as well (Foo, 2011). Entrepreneurs tend to categorize opportunities as having more upside and strengths, and potential for improvements than the non-entrepreneurs (Palich & Ray Bagby, 1995). Furthermore, entrepreneurs often underestimate the risks and overestimate the chances of success (A. C. Cooper, Woo, & Dunkelberg, 1988; Kahneman & Lovallo, 1993). Combining these two tendencies suggest that individuals with entrepreneurial experience are less fazed by risks when evaluation an opportunity. Therefore the final hypothesis is proposed:

Hypothesis 7: Entrepreneurial experience moderate the relationship between the Worst-case Scenario and Opportunity Attractiveness such that the negative relationship is less negative when individuals have entrepreneurial experience.

3 RESEARCH METHODOLOGY

3.1 Research strategy

The opportunity evaluation is analyzed by a conjoint experiment. Conjoint experiments are based on the concept that consumers evaluate the value of a product or service as a whole by judging multiple attributes and combining the separate amounts of value of each attribute. The conjoint experiment is a research method that originated from the research field of Marketing, conceptualizing consumers' decisions as trade-offs among multi-attribute products or services. It is a method suitable for understanding consumers' evaluations of predetermined attribute combinations that represent potential products or services, to provide insight into the composition of consumer preferences (Hair, Anderson, Tatham, & Black, 1998).

Entrepreneurial opportunities can be evaluated in the same manner, assessing the overall degree of attractiveness by judging a set of opportunity characteristics (Dimov, 2007; Simon et al., 2000). The conjoint experiment tests the attractiveness by asking respondents to make a series of subjective judgments on theory-based factors (the characteristics). The respondents have to perform one task: rate the overall attractiveness of the opportunity. Respondents do not have to explain why they made their choice or how they made it. By creating specific combinations of factor levels (the value of the factor) the researcher can analyze the utility of each factor and how differing levels of factor influence the formation of the overall attractiveness.

Conjoint experiments have proven to be a useful method in the field of Entrepreneurship to analyze how individuals make decisions (e.g. Haynie et al., 2009; McKelvie et al., 2011; Shepherd & Zacharakis, 1997), to understand how opportunity evaluation decisions are made (Lohrke, Holloway, & Hoolley, 2010), and its results 'can predict real behavior of real individuals in real situations' (Louviere, 1998).

Moreover, conjoint experiments are able to estimate the utility per factor. While previous qualitative studies have uncovered multiple variables impacting the opportunity attractiveness, they have not determined the specific utilities of these variables or their interaction effects. The setup of the conjoint experiment also allows for the control of the factors and so comparisons of attractiveness ratings between respondents are possible. Researching actual real-life opportunity evaluations on the other hand does not have this level of control, thus it can only be assumed that the relevant opportunity factors were known to and used by the decision maker. Additionally, real-life evaluations are more heterogeneous in nature than the ones in the conjoint experiment, making their comparisons more difficult, and therefore possibly leading to incorrect or biased results.

Conjoint experiments allow for the analysis of current opportunity evaluations, instead of relying on retrospective data. Researchers of several qualitative studies have interviewed entrepreneurs about past evaluations (e.g. Bryant, 2007; Gibcus & van Hoensel, 2003; Rice, Kelley, Peters, &

Colarelli O'Connor, 2001), thereby potentially introducing recall or report biases. Conjoint experiments on the other hand rely directly on current data by anonymous and confidential data collection, preventing biases due to self-analysis difficulties, shame, socially-desirable answers, or due to trying to impress the interviewer. These features make conjoint experiments an appropriate and useful method to research opportunity evaluations.

3.2 Research design

This study uses a traditional conjoint experiment to determine the opportunity attractiveness. In a traditional conjoint experiment the respondents are presented with several product concepts and are asked to rate or rank those product concepts. From the respondents' evaluations can then the utility of each opportunity feature be determined. The traditional conjoint experiment in this study consists of a real-life entrepreneurial opportunity and eleven scenarios based on the three opportunity characteristics. By using the overall attractiveness ratings per scenario, the utility of each characteristic (the β coefficient) can then be determined using maximum likelihood estimations. The β coefficient indicates how much the opportunity characteristic is valued by the respondents, thus showing which characteristics make an opportunity attractive and which do not.

Out of all conjoint techniques, choice-based conjoint analysis is most widely used in the world because of the highly robust theoretical and statistical foundation (Hair et al., 1998; Orme, 2013), still a traditional conjoint experiment was chosen instead. When researching the factor utilities, traditional conjoint experiments are better suited for smaller sample sizes (<100 respondents) than other conjoint techniques (Orme, 2010, 2013), yet the results (the β coefficients) show little difference between both techniques (Elrod, Louviere, & Davey, 1992; Oliphant, Eagle, Louviere, & Anderson, 1992).

The traditional conjoint experiment in this study uses an orthogonal full factorial design. This design, with three factors (Novelty, Resource Efficiency, and Worst-case Scenario) and each having two levels (high/low, or severe/mild in case of the Worst-case scenario), results in eight different scenarios, as can been seen in Table 3 (p. 24). A full factorial design gives a full and realistic portrayal of the opportunity, and was chosen since it provides more factor observations per respondent. As a consequence the reliability of the estimations of the coefficients increases, giving more reliable results with smaller sample sizes. This experiment uses only two levels for multiple reasons. First of all, to keep the total number of stimuli limited to prevent response fatigue and information overload. Secondly, high/low (and severe/mild) is a scale with clear distinction in value, which can be understood on its own and by all respondents. Thirdly, it is relevant to and a realistic value of the independent variables. Fourth and final reason, similar levels for each factor prevents focusing on one specific factor more than on the others, possibly influencing its importance (Wittink, Krishnamurthi, & Reibstein, 1990). The relationship between the levels per factor, i.e. the coefficient relationships, is linear, meaning that an increase in level value results in

a higher opportunity attractiveness for Novelty and Resource Efficiency, and a lower opportunity attractiveness for Worst-case Scenario.

A description of an entrepreneurial opportunity was presented to the respondents. This opportunity is a real and new technology called In-Situ Plating, an innovative material coating process that improves the electrical conductivity of common metals. This technology reduces the number of steps required to coat non-conductive materials and has been patented by the Columbia University's Technology Transfer Office (Wood & Williams, 2014). The complete opportunity description can be found in Appendix 1. A technological change is often a source of a business opportunity (Baron & Ensley, 2006; McMullen & Shepherd, 2006; Shane, 2000; Zahra, 1996) and therefore an actual change in technology is used in the conjoint experiment. More specifically, in order to represent a legit business opportunity the technology must contain the opportunity features which were found desirable by prior research (Baron & Ensley, 2006), be feasible to exploit (Gaglio, 2004; Keh et al., 2002; Krueger, 2000) and fulfill a market need (Baron & Ensley, 2006; Grégoire, Barr, et al., 2010). The new In-Situ Plating technology fits these criteria.

Based on the In-Situ Plating opportunity, respondents were presented a series of scenarios to evaluate. Scenarios are regularly used in the Business research, for example to evaluate individual decision-making, risk perception, or cognitive mechanisms (respectively Wasieleski & Weber, 2009; Doff, 2008; Grégoire, Barr & Shepherd, 2010). Scenarios provide a practical method to describe the situation, to vary the independent variable levels, and to present the respondents with a decision task in a realistic way, making it a useful tool for this study.

The dependent variable, the degree of opportunity attractiveness, can be scored on a rating scale or by rank-ordering the scenarios. Ranking the scenarios is not always as easy as it seems. Choosing the best and the worst scenario is usually very doable for most respondents, but ranking the middle ground is often far harder. The perceived values are a lot closer to each other and respondents struggle to translate their feelings for each scenario into a ranking (Hair et al., 1998). A rating scale on the other hand allows for independent scoring of each scenario instead of the relative ranking, as well as identical ratings for different scenarios, thus making the scoring easier to perform. A rating scale was therefore chosen as the measure of the opportunity attractiveness.

Since each scenario represents a different combination of factors, each rating is then a single-indicator measure. A single-indicator measurement could potentially lead to measurement issues (Boyd, Gove, & Hitt, 2005). To validate the quality of the measurements (the ratings) three repeat scenarios were included for a response reliability check and consequently the questionnaire contained a total of eleven full-profile scenarios to be evaluated by the respondents. Out of the 8 possible scenarios, three scenarios were randomly chosen to serve as the repeat scenarios (nr. 4, 5 and 2 from Table 3 (page 24)). Using only these three repeat scenarios per respondent ensures enough data is collected to accurately determine the response reliability. The eleven scenarios were presented in random order, only the repeat scenarios were explicitly not placed after each other.

3.3 Sample

This study focuses on novice opportunity evaluators and as a sample students from the University of Twente were used. Firstly, students entrepreneurs were solicited for this study, defining student entrepreneurs as students who have started or run at least one business (Rauch & Frese, 2007; Stewart & Roth, 2007). Additionally, students without entrepreneurial experience were invited to participate. Because human capital, in particular higher education, has an impact on the development of entrepreneurial awareness and entrepreneurial intentions (Block et al., 2011), university education can lead to the development of an entrepreneurial mindset and consequently university students have been found to be able to identify business opportunities, despite not having any actual entrepreneurial experience (Costa et al., 2016). Therefore students with no entrepreneurial experience are also well suited to be used as a sample for this study.

University of Twente itself is the most entrepreneurial university in the Netherlands ("UT again voted most", 2015) with commercial knowledge transfer as its third core task, next to education and research. It has the highest number of spin-off companies, the highest number of companies in its science park, several incubator programs and venture capital funds, in order to get start-ups off to a flying-start. It combines academics and entrepreneurship in order to put knowledge into commercial use, making its students potential entrepreneurs. This then makes the University of Twente the appropriate university to recruit students for this study.

The sampling method 'snowballing' was used; from the personal network of the author suitable candidates were selected and invited to participate, then these participants suggested other suitable candidates for this study. Attention was given to having fairly equal numbers of respondents in the subgroups (Education, Entrepreneurial Experience, Gender), in order to get stable regression results despite a relatively small sample. A total of 96 students were invited to participate, either in person or via email. After the initial contact, non-respondents were followed up after one week and after two weeks to kindly request filling out the questionnaire. In all, 73 students filled out the questionnaire, resulting in an acceptable response rate of 76.0 percent (Baruch & Holtom, 2008). Not all returned questionnaires were fully completed. The partially filled-out questionnaires were deleted and 69 valid questionnaires remained. The sample statistics are shown in Table 1.

The general recommendation is to have at least 10 to 20 times as many subjects as predictor variables, to be able to produce a stable regression line and replicable results (Moons, Royston, Vergouwe, Grobbee, & Altman, 2009; Wilkinson, 1979). For this study, this would mean between 30 and 60 respondents. This study's sample size of 69 is above the upper limit and thus regarded as acceptable. This study's sample size is also comparable to other published conjoint experiment studies in the fields of Entrepreneurship and Organizational Science, as can be seen in Table 2.

Table 1. Sample statistics (N = 69)

Variable	*N*	*%*	*Mean*	*SD*
Age			23.17	2.23
Gender				
Male	40	58.0%		
Female	29	42.0%		
Education				
Technical	31	44.9%		
Non-technical	38	55.1%		
Enrolled in a Bachelor's program	36	52.2%		
Enrolled in a Master's program	33	47.8%		
Prior knowledge of opportunity			1.55*	1.04
Prior entrepreneurial experiences			0.97**	2.07
Yes	19	27.5%		
No	50	72.5%		

* Mean score on a 7-point Likert scale, ** Mean number of practiced years.

Table 2. Prior conjoint experiment studies and their sample size

Authors	*Sample size*
Baker, Aldag & Blair (2003)	61
Franke, Gruber, Harhoff & Henkel (2008)	51
Haynie, Shepherd & McMullen (2009)	73
Murnieks, Haynie, Wiltbank & Harting (2011)	60
Priem & Rosenstein (2000)	33
Shepherd & Zacharakis (1997)	66
Wood & Williams (2014)	62
Zacharakis & Meyer (1998)	63

3.4 Data collection

Data was collected by questionnaire, administered in English via a website, and contained two sections. Section A: Information about the study, instructions on the conjoint task, and the description of the entrepreneurial opportunity, and Section B: A series of scenarios and several background questions about the respondent. The questionnaire can be found in Appendix 1.

Firstly, in section A., respondents were informed on the purpose of the research, on the time it takes to complete the questionnaire, instructed that participation was voluntary, assured of the anonymity and confidentiality of their data, and notified that all data would be only used for this research. Next, respondents were instructed that they individually would be making a series of

opportunity evaluations, having to rate the subjective attractiveness of eleven scenarios on a 7-point scale, whereby each scenario consisted of a different combination of Novelty, Resource Efficiency and Worst-case Scenario. Respondents had to assume they were an actual entrepreneur, that this was a real situation, and that they would have the skills and resources to pursue the opportunity if they chose to do so.

Section B. contained the eleven scenarios to be rated. By using a web-based approach, the scenarios could be presented on separate screens and the respondents were not allowed to go back to the previous scenarios and given ratings. This way each scenarios had to be judged independently. Furthermore, three websites were created, each having the scenarios in a randomized and different order, and respondents were randomly assigned one of the three websites.

The experiment was pre-tested to check if the factors were perceived as intended, checked for clarity and understandability of the instructions and the opportunity description, and to ensure respondents could complete the questionnaire within a reasonable time. See paragraph 3.6 for more pre-test information.

The data was collected in August of 2017 and it took an average of 10 minutes to complete the web-based questionnaire.

3.5 Variables

Independent variables. Based on theory, three independent variables were decided upon: Novelty, Resource Efficiency and Worst-case Scenario. Novelty and Resource Efficiency had the same levels: low vs. high. Worst-case Scenario had similar level values: mild vs. severe. Eight different full-profiles were constructed by varying these levels, as shown in Table 3.

Table 3. The complete set of scenarios

	Levels		
Scenario	*Novelty*	*Resource Efficiency*	*Worst-case Scenario*
1	High	High	Severe
2	High	High	Mild
3	High	Low	Severe
4	High	Low	Mild
5	Low	High	Severe
6	Low	High	Mild
7	Low	Low	Severe
8	Low	Low	Mild

Dependent variable. Opportunity Attractiveness. Personal evaluations by the respondent of each scenario, by asking if the opportunity was attractive for him/her specifically. Opportunity attractiveness is operationalized as the degree of viability of creating a new business based on the described entrepreneurial opportunity and the additional scenario information. Rating was done using a 7-point Likert scale (1 = not at all attractive, 7 = highly attractive).

Moderator variables. Education and entrepreneurial experience were the moderator variables. Respondents were asked to state which education program they were enrolled in, which later was converted to a technical vs. non-technical study by the author. Furthermore, respondents were asked to state their prior entrepreneurial experience, measured by the number of years of practiced entrepreneurship.

Control variables. The last section of the questionnaire contains several background questions, including questions about prior knowledge of the described entrepreneurial opportunity and gender. Extant research argues that related prior knowledge influences the evaluation of entrepreneurial opportunities (Baron & Ensley, 2006; Haynie et al., 2009; J. R. Mitchell & Shepherd, 2010) and therefore the prior knowledge of the task opportunity is controlled for. The degree of prior knowledge was determined by a rating on a 7-point Likert scale (1 = no prior knowledge at all, 7 = high level of prior knowledge). Next, multiple studies have found differences between men and women in evaluating opportunities, depending on how a new business opportunity is presented (Gupta, Goktan, & Gunay, 2014) and due to differences in risk preference (Baker, Aldag, & Blair, 2003; Byrnes, Miller, & Schafer, 1999; Powell & Ansic, 1997; Scollard, 1995). Consequently gender is included as a control variable in this study.

3.6 Pre-test

The questionnaire was pre-tested to check whether the independent variables were sufficiently understandable, its levels sufficiently clear in the scenarios, to clarify any issues or questions, and to see whether the questionnaire could be completed within a reasonable time, i.e. under 20 minutes (D. R. Cooper, Schindler, & Sun, 2003).

For this pre-test 20 students from the University of Twente were randomly recruited on the campus and invited to fill out a paper-based version of the questionnaire. Pre-test sample statistics can be found in the Table 4.

Table 4. Pre-test sample statistics (N = 20)

Variable	*N*	*%*	*Mean*	*SD*
Age			22.85	2.68
Gender				
Male	11	55%		
Female	9	45%		
Education				
Technical	12	60%		
Non-technical	8	40%		
Enrolled in a Bachelor's program	8	40%		
Enrolled in a Master's program	12	60%		
Prior knowledge of opportunity			1.55*	1.00
Entrepreneurial experience			0.15**	0.49
Yes	2	10%		
No	18	90%		

* Mean score on a 7-point Likert scale, ** Mean number of practiced years.

Preliminary analysis and feedback. The number of participants in each subgroup was divided fairly equally, only the number of entrepreneurs was remarkably low and an area of concern. Since this study aims to check for response differences between student entrepreneurs and non-entrepreneurs, more student entrepreneurs need to participate in order to obtain significant results. For the pre-test a paper-based, personal approach was used, resulting in a high response rate of 90.9%, but unfortunately far too few entrepreneurs. The final data collection method is therefore switched to a web-based questionnaire to solicit more student entrepreneurs. It will also make it easier to solicit more students in general. Next, the prior knowledge of the entrepreneurial opportunity was mostly 1 (No prior knowledge at all), with only one respondent having some prior knowledge, having rated 5 (Somewhat prior knowledge). The lack of prior knowledge did not seem to hinder the evaluation of the scenarios.

Average time to complete the questionnaire was 9.9 minutes and overall the feedback was positive. The instructions, the task, the entrepreneurial opportunity, and the variables were found to be clear and understandable to the respondents. Some minor comments were made about the instructions being too long and that the text could benefit from the use of more layman's terms. Adjustments were made accordingly.

The questionnaire contains 3 repeat scenarios (scenario's 4, 5 and 2) to check the response reliability. The ratings on the 3 repeat scenarios were compared to the original ratings to determine whether identical or similar answers are given to the same scenario, indicating reliable ratings given by the respondents. The response reliability in the pre-test, calculated in Microsoft Excel 2016 using Spearman's rho, was:

- Scenario 4: ρ = 0.55
- Scenario 5: ρ = 0.63
- Scenario 2: ρ = 0.88

An overview of all ratings given on these three scenarios, the original and repeat scenario's, can be found in Appendix 2. The ratings of original and repeat scenarios were medium to highly correlated, despite the small sample size. This indicates consistent ratings are given to the different scenarios and thus the data is reliable. Unfortunately the repeat scenarios were noticed by some of the respondents and this could obviously effect their responses given to both scenarios. A web-based questionnaire will also remedy this problem, since it will prevent respondents from referring back to previously given ratings.

3.7 Data analysis

Attractiveness of the entrepreneurial opportunity was rated on a 7-point Likert scale, resulting in a set of ordinal data with seven ordered categories. To analyze this data a rank-ordered logistic regression model was applied, having the following form:

$$Y = \beta_1 * X_1 + \beta_2 * X_2 + \ldots + \beta_p * X_p + \varepsilon$$

where the β coefficients are estimated using the method of maximum likelihood and the residual ε has an 'extreme value distribution of type I' (i.e. non-normal distribution). Following the theory of maximum utility, the scenario with the highest estimated utilities is assumed to be the most attractive opportunity.

The data from the questionnaires was analyzed in Stata 14.2. Its rank-ordered logistic model can estimate the main effects and other complex correlations, such as interaction effects. Although ranking is not the same as rating, the rank-ordered logistic model permits ties in the rankings, which makes it also useable for the rating scale used in this study's questionnaire.

In total six models were used to test the hypotheses. In Model 1 rank-ordered logistic regressions were done to estimate the main effects and the results were used to test H1, H2 and H3. Model 2 used an interaction term, created by multiplying the Worst-case Scenario with one of the two independent variables, to determine the interaction effects and test H4a and H4b. Finally, Model 3 and Model 4 tested whether the model coefficients varied between different groups of respondents. Rank-ordered logistic regressions were performed to estimate the interaction effects of respectively Education and Entrepreneurial Experience. H5 was tested in Model 3, and Model 4 was used to test H6 and H7. The control variables could not be implemented in the first four regression models, since the control variables had no within-respondent variance. Still to examine whether these two control variables had any interaction effects two additional regression models were created: Models 5 and 6, testing the interactions of respectively Gender and Prior Knowledge.

4 RESULTS

4.1 Reliability testing

The first step was to check the reliability of the evaluations given by the respondents. Each questionnaire had 3 repeat scenarios and these were compared to the original scenario ratings. Correlations are determined by the Spearman's rank-order correlation coefficient for ordinal data. Spearman's correlations determine whether the variables are monotonically related, which results in a correlations coefficient between -1 and +1. Spearman's coefficient is the Pearson correlation coefficient between the ranked variables and these values can be interpreted in the same manner as Pearson's correlation coefficient (Myers & Well, 2003). Spearman's correlation will be very strong ($\rho > 0.9$) when mostly identical rating are given and moderately strong ($\rho = 0.50 - 0.70$) when adjacent ratings are given to the repeat scenarios (Hinkle, Wiersma & Jurs, 2003, as cited in Mukaka, 2012). Analysis in Stata 14.2 showed the following Spearman's coefficients for the three repeat scenarios:

- Scenario 4: $\rho = 0.44$, $p < 0.001$
- Scenario 5: $\rho = 0.52$, $p < 0.001$
- Scenario 2: $\rho = 0.83$, $p < 0.001$

Reliable responses mean a substantial correlation between the ratings of the original and the ratings of the repeat scenarios (Hair et al., 1998). The results show that the scenarios ratings were moderately to highly correlated, thus the same or almost similar ratings were given to both scenarios. As mentioned in 3.2 Research design, rating the middle ground is often far harder than rating the extremes as the perceived utilities are a lot closer to each other (Hair et al., 1998). Scenario 2 is an extreme scenario, having the most theoretically positive factor values, whereas the other two scenarios can be considered as middle ground. The lower Spearman's coefficient of Scenarios 4 and 5 confirm these rating difficulties. Furthermore the correlation coefficients are quite similar to the pre-test sample, although a little bit lower due to the website's inability to refer back to previously given rating, making it impossible to compare scenarios and given ratings. Overall, these results imply consistent and reliable evaluations were given by the respondents.

4.2 Variables and correlations

Table 5 shows the correlations between the given independent variables. All three independent variables have zero intercorrelations and therefore multicollinearity is not an issue. The mean value for Opportunity Attractiveness across all scenarios is 3.48. Direct correlations of the measured variables with Opportunity Attractiveness are almost non-existent, which was to be expected since only interaction effects were hypothesized.

Table 5. Means, standard deviations, and correlations for variables

			Correlations							
Variable	*Mean*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. Opportunity Attractiveness	3.48	1.81	1.000							
2. Novelty			0.309*	1.000						
3. Resource Efficiency			0.507*	0.000	1.000					
4. Worst-case Scenario			-0.445*	0.000	0.000	1.000				
5. Education	1.55	0.50	0.002	0.000	0.000	0.000	1.000			
6. Gender	1.42	0.49	0.011	0.000	0.000	0.000	0.415*	1.000		
7. Entrepreneurial Experience	0.97	2.07	0.010	0.000	0.000	0.000	-0.167*	-0.399*	1.000	
8. Prior knowledge of opport.	1.55	1.04	0.018	0.000	0.000	0.000	0.361*	-0.168*	0.168*	1.000

* $p < 0.001$. Education: 1=technical study, 2=non-technical study. Gender: 1=male, 2=female. Entrepreneurial Experience: number of practiced years. Prior knowledge of opportunity: 7-point Likert scale rating.

4.3 Rank-ordered logistic modeling

The results of the rank-ordered logistic modeling can be seen in Table 6. In Model 1 the main effects are all highly significant ($p < 0.001$) and thus the null hypothesis can be rejected. The coefficient for Novelty is positive ($\beta = 1.34$), indicating that Opportunity Attractiveness increased when Novelty was high as opposed to low. This result supports Hypothesis 1. Resource Efficiency is also positive ($\beta = 2.07$), meaning Opportunity Attractiveness was higher when Resource Efficiency was high as opposed to low and providing support for Hypothesis 2. Then, Worst-case Scenario was negative ($\beta = -1.95$). This indicates that Opportunity Attractiveness decreased when Worst-case Scenario was severe as opposed to mild and this supports Hypothesis 3. Overall, Resource Efficiency and Worst-case Scenario had the largest coefficients and thus the results suggest that the respondents regarded these two factors as the most important opportunity characteristics in the evaluations of Opportunity Attractiveness.

Model 2 tested the interaction effects of Worst-case Scenario on the other two independent variables. The estimated effects are negative but not significant, with Novelty × Worst-case Scenario having a $\beta = -0.04$ and $p = 0.883$, and Resource Efficiency × Worst-case Scenario having a $\beta = -0.20$ and $p = 0.457$. Although both coefficients are negative as hypothesized in Hypothesis 4a and 4b, the results are not statistically significant and thus we cannot reject the null hypothesis in this model. Hypotheses 4a and 4b are therefore not supported.

Education (technical vs. non-technical students) as an interaction effect was tested in Model 3 and resulted in two statistically significant coefficients, a negative coefficient for Resource Efficiency ($\beta = -0.68$ and $p = 0.04$) and a positive coefficient for Worst-case Scenario ($\beta = 0.62$ and $p = 0.05$). (Officially the p-value for Education × Worst-case Scenario is 0.051, so above the critical value of 0.05. Still the difference is only 0.001 and therefore still seen as significant). This second

Table 6. Rank-ordered logistic regression results

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Novelty	1.343***	1.402***	1.362**	1.244***
	(0.133)	(0.388)	(0.445)	(0.146)
Resource Efficiency	2.071***	2.363***	3.168***	2.047***
	(0.155)	(0.424)	(0.557)	(0.171)
Worst-case Scenario	-1.948***	-1.576*	-2.946***	-2.010***
	(0.151)	(0.640)	(0.538)	(0.168)
Worst-case Scenario × Novelty		-0.037		
		(0.251)		
Worst-case Scenario × Resource Efficiency		-0.202		
		(0.271)		
Education × Novelty			-0.008	
			(0.270)	
Education × Resource Efficiency			-0.681*	
			(0.326)	
Education × Worst-case Scenario			0.616*	
			(0.316)	
Entrepreneurial Experience × Novelty				0.116
				(0.075)
Entrepreneurial Experience × Resource Efficiency				0.040
				(0.078)
Entrepreneurial Experience × Worst-case Scenario				0.054
				(0.070)
Observations	552	552	552	552
No. of individuals	69	69	69	69
log(likelihood)	-365.725	-368.570	-362.380	-363.347

* p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses. Education: 1=technical study, 2=non-technical study. Entrepreneurial Experience: number of practiced years.

coefficient indicates that the relation between Worst-case Scenario and Opportunity Attractiveness is less negative when respondents do a non-technical study, thereby rejecting Hypothesis 5.

Model 4 investigated the interaction effects of Entrepreneurial Experience. This model did not lead to any statistically significant interaction effects, so respondents' entrepreneurial experiences did not make a difference in the evaluations, thus showing no support for Hypothesis 6 and 7.

4.4 Explorative interaction analysis

Next to the first four regression models used for the hypothesis testing, additional analyses were done to investigate other interaction effects. As mentioned before in paragraph 3.5 Variables, two control variables were specified based on extant literature, namely Gender and Prior Knowledge,

and prior research showed these two variables can lead to evaluation differences. To examine whether these two control variables had any interaction effects two additional regression models were created, Model 5 and Model 6. The results are shown in Table 7.

The evaluation differences by gender were tested in Model 5. Minor interaction effects were found in this model but only one was significant, namely the interaction with Resource Efficiency (β = -0.69 and p = 0.03), meaning that the relation between Resource Efficiency and Opportunity Attractiveness was more negative when the respondents were female. In Model 6 the interaction effects of Prior Knowledge were tested. This lead to only one significant and positive effect on Resource Efficiency (β = 0.32 and p = 0.06), implying that the relation between Resource Efficiency and Opportunity Attractiveness becomes more positive when Prior Knowledge is higher.

Table 7. Rank-ordered logistic regression results for control variables

Variable	*Model 1*	*Model 5*	*Model 6*
Novelty	1.343**	1.802**	1.379**
	(0.133)	(0.416)	(0.238)
Resource Efficiency	2.071**	3.081**	1.590**
	(0.155)	(0.495)	(0.293)
Worst-case Scenario	-1.948**	-2.401**	-1.861**
	(0.151)	(0.471)	(0.278)
Gender × Novelty		-0.311	
		(0.268)	
Gender × Resource Efficiency		-0.689*	
		(0.312)	
Gender × Worst-case Scenario		0.308	
		(0.305)	
Prior Knowledge × Novelty			-0.018
			(0.127)
Prior Knowledge × Resource Efficiency			0.324†
			(0.175)
Prior Knowledge × Worst-case Scenario			-0.069
			(0.155)
Observations	552	552	552
No. of individuals	69	69	69
log(likelihood)	-365.725	-363.173	-363.308

† = p < 0.1, * p < 0.05, ** p < 0.001. Standard errors in parentheses. Gender: 1=male, 2=female. Prior Knowledge: 7-point Likert scale rating.

5 DISCUSSION AND CONCLUSION

5.1 Discussion

The analysis of the opportunity evaluations done by students with no or limited entrepreneurial experience has produced several findings. First of all, all three evaluation rules are relatively important and higher Novelty and Resource Efficiency leads to higher Opportunity Attractiveness, and higher Worst-case Scenario leads to lower Opportunity Attractiveness, which is in line with the expectations. Extant literature has also found each of the three evaluation rules to be important in opportunity evaluations (Baron & Ensley, 2006; Wood & Williams, 2014). Nevertheless little research has been done on specific utility values for each evaluation rule. The main results show not all evaluation rules have equal importance. Resource Efficiency has the highest utility value, Worst-case Scenario is a close second and Novelty has the lowest utility value.

While some differences in the importance of each evaluation rule might be expected, analysis found the importance of Novelty to be considerably lower than the other two. A reason for this result could be that respondents focused more on the downsides than on the potential gains, such as associating higher Novelty with higher demand uncertainty or higher likelihood of failure. Respondent could then choose to rather miss the opportunity than to take the leap into the unknown (Mullins & Forlani, 2005). Further, respondents might prefer opportunities more related to their knowledge base which are then better understood and within their control (Wincent & Örtqvist, 2009), thus not preferring high Novelty.

Resource Efficiency was found to be the most important factor in the assessment of the opportunity attractiveness. This result is in line with previous research on resource utilization and the subsequent firm performance and survival, which highlights the importance of applying constraint resources to their first and best use (Barney, 1991; Penrose, 1959; Wu, Wang, Chen, & Pan, 2008).

The Worst-case Scenario was the second most important evaluation rule in the evaluations of Opportunity Attractiveness. The strong negative relationship between Worst-case Scenario and Opportunity Attractiveness is consistent with extant literature in which high risks (a severe Worst-case Scenario) lead to less positive evaluations (Keh et al., 2002; Miller, 2007; Palich & Ray Bagby, 1995). This result also parallels existing research on regret in entrepreneurship (e.g. Baron, 2000), which shows how individuals try to make decisions that do not end up with regret, and affordable loss theory (e.g. Dew, Read, Sarasvathy, & Wiltbank, 2009) that states that individuals carefully consider how much loss is affordable and that entrepreneurs will rather 'risk missing the boat than sinking the boat' (Mullins & Forlani, 2005), consequently making relatively risk-averse choices.

Second, prior research has found high entrepreneurial risk can lead to feelings of fear, regret, and doubt, which in turn can have consequences for subsequent entrepreneurial activities (Baron,

1998; Grichnik et al., 2010; Wood & Williams, 2014). The results in this study do not confirm these findings, as the results show no significant Worst-case Scenario interactions effects. A high Worst-case Scenario did not lead to an overall loss of faith in the opportunity and consequently a weakening of the relations of other evaluation rules. This contrasting finding suggests a high Worst-case Scenario does not always impact other evaluation rules and, while being a highly important evaluation rule by itself, a high Worst-case Scenario does not make the entire entrepreneurial opportunity unattractive. Apparently respondent can deal with high Worst-case Scenario or do value high Novelty and high Resource Efficiency and will then accept the high risk.

Third, examining opportunity evaluation differences due to the respondents' education found significant differences between technical and non-technical students. Extant literature on human capital and on the effects of having relevant, related knowledge have shown positive impacts subsequent opportunity evaluations (Haynie et al., 2009; Shane, 2000). Additionally, as individuals gain experience in a certain domain they become increasingly focused on key attributes of that domain (Matlin, 2005), suggesting technical student will value technical aspects more. This study found similar results, as Resource Efficiency was valued more positively when students did a technical study. On the other hand Worst-case Scenario became less negative when students did a non-technical study, which contrasts existing literature. Non-technical students were expected to be more analytical in their decision-making and therefore more risk averse (Gustafsson, 2006; Hambrick & Mason, 1984). This contrarian result could be due to non-technical students seeing more upside and potential gains in a high risk opportunity. Another explanation could be that the technical student better understood the entrepreneurial opportunity, therefore better understood the related risks and consequently valued a high Worst-case Scenario as even less attractive.

While prior research has shown that a higher level of education positively affects the opportunity identification process (Arenius & Clercq, 2005; Ramos-Rodríguez, Medina-Garrido, Lorenzo-Gómez, & Ruiz-Navarro, 2010; Shane, 2003), findings on the influence of the type of education have remained mostly absent or non-significant. This study on the other hand did find two significant interaction effects, showing differences between technical and non-technical student can occur and thereby providing new insights in the opportunity evaluation preferences.

Fourth, prior entrepreneurial experiences of the respondents did not make a significant difference in the Opportunity Attractiveness judgements, while differences in the knowledge base and in the risk perceptions of individuals without and with entrepreneurial experience would suggest differences in their evaluation rule utility values. Current results, while unexpected, can be explained by the university education of the respondents. University education can to lead to the development of an entrepreneurial mindset and for example university students have been found to be able to identify business opportunities, despite not having any actual entrepreneurial experience (Costa et al., 2016). The university education of this study's sample could then lead to the disappearance of the differences between respondents with and without actual entrepreneurial experience. Furthermore, it confirms the title of University of Twente as the most entrepreneurial

university in the Netherlands, since the University of Twente combines academics and entrepreneurship in order to put knowledge into commercial use, making its students potential entrepreneurs.

Finally, the analyses of control variables resulted in two significant interaction effects. The first one was the interaction of Gender on Resource Efficiency. Although Gender is often included as a control variable in entrepreneurship studies, the findings vary wildly, from significant interaction effects (e.g. Baker et al., 2003; Byrnes et al., 1999; Gupta et al., 2014) to no effects at all (e.g. Bishop & Nixon, 2006; Foo, 2011; Westhead, Ucbasaran, & Wright, 2005). In general, these opposing findings could suggest only very specific gender interaction effects exist or the existence of other unseen mediator variables. This study did find an interaction effect: the relation between Resource Efficiency and Opportunity Attractiveness is more negative when respondents are female. When looking at the education of the female respondents, the correlation table in paragraph 4.2 shows female respondents predominantly follow non-technical studies. In Model 3 the interaction of Education on the relation between Resource Efficiency and Opportunity Attractiveness was already found, demonstrating Resource Efficiency to be more negative when respondents follow a non-technical study. This would then explain why female respondents find Resource Efficiency less important.

The second control variable Prior Knowledge of the entrepreneurial opportunity resulted in one interaction effect, namely the relation between Resource Efficiency and Opportunity Attractiveness becomes more positive when Prior Knowledge is higher. Extant research has on multiple occasions shown the positive influences of prior related knowledge on opportunity evaluations (e.g. Haynie et al., 2009; Shane, 2000; Wood & Williams, 2014). Still the results from this study do not show similar strong effects as prior research. A reason for this divergent result can be due to the small number of respondents who had some (i.e. medium to high level of) Prior Knowledge, as the Prior Knowledge mean was only 1.55 (SD = 1.04). Small groups have a higher chance of not being representative of their population (Sandelowski, 1995), which therefore can lead to different results compared to the extant studies on Prior Knowledge.

Evaluation rules: novice vs. experienced entrepreneurs.

The rule-based reasoning evaluation framework was originally develop by Wood & Williams (2014). Their study used the same conjoint experiment and the same three evaluation rules as in this study allowing for some general comparisons.

Comparing the main effects, Novelty has the smallest coefficient in both studies, yet Worst-case Scenario has by far the largest coefficient in the original Wood & Williams study, unlike this study where Resource Efficiency has the largest coefficient. The experienced entrepreneurs in the Wood & Williams study thus seem to have different preferences for their entrepreneurial opportunities than the university students, with limited or no entrepreneurial experience, in this study. This finding could suggest experienced entrepreneurs focus more on acceptable risks and affordable losses.

This finding would be in line with prior research that found that more entrepreneurial experience leads to a higher focus on actually starting and running a new venture, such as focusing more on a manageable risk (Baron & Ensley, 2006).

In the Wood & Williams study statistically significant differences were found between entrepreneurs with and without knowledge of the opportunity technology. In comparison, this study found only one minor significant interaction, namely the relation between Resource Efficiency and Opportunity Attractiveness becomes more positive when Prior Knowledge is higher. Unfortunately due to the small number of respondents in this study who had some (i.e. medium to high level of) Prior Knowledge, it is difficult to make any definitive statements about these different results.

Overall this study found only very limited differences between subgroups of respondents. The study by Wood & Williams did find multiple significant differences, due to the knowledge of the opportunity market and the knowledge of the opportunity technology. Consequently one could hypothesize that entrepreneurship and business knowledge lead to more differences in the opportunity evaluations than the education of the evaluators, suggesting specific relevant knowledge leads to more distinctive outcomes in the evaluations than general knowledge.

5.2 Theoretical implications

The results from this study contribute to entrepreneurship research by showing that rule-based reasoning is an useful and appropriate way to understand entrepreneurial opportunities and the evaluation framework provides a structured way to evaluate the opportunities. Opportunity-specific knowledge is used to create specific decision rules and then a set of these normative rules allows individuals to judge whether an opportunity is attractive or not. The evaluation framework explains whether is opportunity is worthy to pursue and why an individual chooses one opportunity over another. Researchers did already find that managers and entrepreneurs try to understand new situations by matching the characteristics of the situation with information stored in their memory (Baron, 2006; Walsh, 1995). Also, research found entrepreneurs use mental templates to understand and evaluate opportunities (Krueger, 2007). The rule-based framework provides an explanation of how this works.

The overarching framework will allows for the integration of prior and future research on opportunity evaluations into a structured way to judge the opportunity attractiveness, to uncover which evaluation rules or sets of rules are used, to examine the utility values of the different evaluation rules and also how they possibly interact. Overall, the overarching framework provides a structure to integrate past fragmented studies into a unified opportunity evaluation method. Furthermore, the evaluation framework will be useful to better understand how entrepreneurs actually evaluate entrepreneurial opportunities, how they structure the decision-making process, and to determine which decisions lead to success and which do not.

This study has focused on the evaluation framework of university students, i.e. individuals who can be regarded as potential entrepreneurs (Block et al., 2011; Costa et al., 2013). The findings contribute to entrepreneurship research by providing new insights into initial evaluation rules of novice and nascent entrepreneurs, since previous studies have mainly focused on experienced entrepreneurs and their opportunity evaluations. These early findings can be used to research differences between novice and experienced entrepreneurs, to uncover shortcomings or pitfalls in the evaluation framework of novice entrepreneurs, and determine a learning path for improving the initial evaluation framework in order to increase the chances of selecting the right entrepreneurial opportunity to exploit, which will then increase the firm's chances of survival and success.

Out of the three evaluation rules that were researched, Resource Efficiency had the highest utility value. Optimal resource deployment is important for the survival and success of the firm (Penrose, 1959; Shane, 2003), which makes it an obvious point of interest for entrepreneurs (Thornberry, 2001). Nevertheless the results from this study show the university students are already highly aware of the importance of optimal resource deployment, thereby validating the previous findings on the entrepreneurial mindset resulting from university education (Costa et al., 2013).

Prior research on the moderating effects of type of education on opportunity evaluations has shown mixed results. Previous studies mostly used entrepreneurs as a sample and then often found no significant interaction effects. This study however did find an interaction effect on Resource Efficiency among the university students. This contrasting result could suggest education can lead to evaluation differences in the beginning, but that the differences will disappear as more entrepreneurial experience is gained. Future research can investigate whether this proposition is correct and under which conditions.

5.3 Practical implications

The use of evaluation rules, a set of opportunity-specific normative rules, proves to be a useful tool to interpret and analyze an entrepreneurial opportunity, and to judge its attractiveness. Since the entrepreneurial opportunity's environment can be uncertain and the available information ambiguous, this evaluation framework can provide structure and guidance to make estimates about its likely future (Barreto, 2012; March, 1994).

By evaluating an entrepreneurial opportunity using this framework, individuals can expose their opportunity characteristic preferences, of which one can be unaware, especially the unpracticed, unexperienced evaluator. Knowing utility differences exist can lead to a better understanding of one's evaluations. Knowledge of your evaluation rules can also uncover biases or shortcomings, and form the basis for further development of your evaluation framework.

Evaluation rules and rule content depend heavily on the knowledge base of the decision-maker (Shane, 2000a; Baron & Ensley, 2006). Nascent and novice entrepreneurs should therefore

thoroughly research the considered opportunity. Not only to determine whether the entrepreneurial opportunity at hand is attractive or not, but also to further develop their personal evaluation framework.

The utility values in this study differ from the utilities of experienced entrepreneurs (Wood & Williams, 2014). Experienced entrepreneurs value the Worst-case Scenario as the most important of the three evaluation rules when assessing the Opportunity Attractiveness. Worst-case Scenario is so influential for experienced entrepreneurs that it even has substantial mitigating effects on the positive relations of the other evaluation rules. Experienced entrepreneurs thus focusing heavily on the survival of the firm and on the level of affordable loss (Dew et al., 2009) and will then rather 'risk missing the boat than sinking the boat' (Mullins & Forlani, 2005). Meanwhile in this study Worst-case Scenario was not the most, but the second most important factor. This result suggest nascent and novice entrepreneurs could benefit from focusing more on the opportunity risks to limit the potential losses and improve the survival chances of the firm.

Additionally, these findings provide entrepreneurship educators with the insight that novice entrepreneurs might not focus enough on the opportunity risks and the potential losses. Entrepreneurship educators should therefore emphasize the importance of understanding the risks involved, the consequences of high opportunity risks, and the strong impact it should have on judging the overall opportunity attractiveness. In doing so, entrepreneurship educators can help develop an expert mindset in novice entrepreneurs (Krueger, 2007).

5.4 Limitations

This study is not without its limitations. First, a conjoint experiment has its advantages, but it also limits the evaluation decisions that can be made. Respondents can only respond to what this study provides in terms of factors and levels. Alternative factors, levels or combinations are outside the scope of this study, although more factors could be relevant when assessing the opportunity attractiveness. Furthermore, conjoint experiments provide a real-time assessment of the opportunity attractiveness, but not necessarily a real-life assessment. Not considering all relevant information and being a simplification of real-life opportunity evaluations are known criticisms of conjoint experiments (Gigerenzer, 1984) and more research is advised in order to fully understand how opportunities are evaluated.

Second, the entrepreneurial opportunity in the conjoint experiment was a legit business opportunity, however it was a technical opportunity. Since the evaluation rules depend heavily on the knowledge base of the decision-maker (Shane, 2000a; Baron & Ensley, 2006) and related prior knowledge has proven to have a positive effect on the ability to evaluate opportunities (Haynie et al., 2009; Wood & Williams, 2014), this could have influenced the opportunity evaluation, leading to unseen differences between technical and non-technical students. Generalizability of the

findings are therefore limited to technical opportunities. Wider generalizability of the findings needs to be determined by future research.

Third, in the questionnaire the respondents were given clear instructions on the task at hand and the underlying assumptions. The pre-testing of the questionnaire gave rise to several questions about the rating task. For this study was chosen to make the rating task clear and understandable for all in order to get like-minded actions and results, and therefore the task instructions were further clarified in the final questionnaire. Although attention was given to make the detailed instructions as neutral as possible, this still could, unintentionally, have led to some steering of the respondents' ratings. This potential influence should be taken into account and the potential consequences should be examined further.

Fourth, the findings in this study only generalize to evaluations of entrepreneurs. The entrepreneur has a large personal influence on the opportunity evaluation and the final outcome. In contrast, decision-making in large companies follow a different strategy, meaning a more structured process, more input by other managers, more decision-making power by other management team members and different views towards risks (Eisenhardt & Bourgeois, 1988). As a result the opportunity evaluations by managers have been found to be different from entrepreneurs (Gruber, Kim, & Brinckmann, 2015). Furthermore, venture capitalists can evaluate opportunities quite differently from entrepreneurs as well, due to differences in their learning process and experiences (Bishop & Nixon, 2006). The opportunity evaluation by others than entrepreneurs can therefore be substantially different.

Fourth, the sample is composed of only university students. University education can lead to the development of an entrepreneurial mindset (Costa et al., 2013), which makes university students a representative sample for novice and nascent entrepreneurs. However entrepreneurs come in all shapes and sizes (Hatten & Coulter, 1997) and the generalizability limits should therefore be researched further. The sample size, although comparable to other conjoint experiments in entrepreneurship research, is relatively small, which can also have consequences for the generalizability of the findings.

Finally, this experiment is a simulated opportunity evaluation task and therefore reflects the *intentions* to start a business based on a specific combination of characteristics. It does not necessarily mean that individuals will act similarly in an actual real-life setting. The evaluations of actually exploited opportunities needs to be examined to validate the findings from this study.

5.5 Future research

This study, as well as the articles by Wood & Williams (2014) and Williams & Wood (2015), show that the evaluation framework useful for evaluating opportunities and can explain why individuals pursue certain opportunities and not others. Still the framework is in the early stages of development and can be developed further in multiple ways.

Research design. In the last years researchers have raised several issues with traditional conjoint experiments (Hair et al., 1998). Firstly, ranking a set of factors is not always as easy as it might seem. Choosing the best and the worst factor is usually very doable for most, but ranking the middle ground is often far harder, especially for larger choice sets, since the perceived values usually are a lot closer to each other. To a lesser extent this issue applies for rating as well. Secondly, ranking and rating-based scales are more susceptible to report bias (Donaldson & Grant-Vallone, 2002). Thirdly, researchers have argued that traditional conjoint analysis, the judgment based on ranking or rating, is not the most realistic way to depict the actual decision-making process. On the other hand the choice-based conjoint method, where the respondent has to choose one stimulus out of a set of alternative stimuli (the choice set), is more representative of the actual process of selecting a product from a set of competing products (Hair et al. 1998). The traditional method also lacks a formal theory linking ranking or rating judgments to actual choices (Louviere & Woodworth, 1983). Choice-based conjoint experiments are commonly used in Marketing research to investigate consumer choice (Hair et al., 1998) and choosing an opportunity is not the same as choosing a product or service. Still it would be interesting to study opportunity evaluations using a choice-based conjoint experiment, in order to investigate the influence of the research design, examine differences and to validate the findings from this study.

Research strategy. Early indications have been found that opportunity evaluations could be a 2-phase process (Gustafsson, 2006), having the following two phases:

1. Preliminary selection on matching or compatibility rules
2. More deliberate evaluation: updating, mental simulations, dominance search, profit testing.

Future research, using other research strategies than conjoint experiments, could investigate the presence of these two phases and could then determine when the use of the evaluation framework is appropriate and when it is not.

Opportunity evaluations researchers have mostly studied the evaluation process at a single point in time, neglecting its evolution over time as individuals' knowledge, experiences and circumstances change (Dimov, 2007). Reflection on the use of certain evaluation rules could trigger adjustments in the use of those rules or their utility values, leading to more systematic changes over time, such as simplification cycles (Bingham, Eisenhardt, & Davis, 2007). Longitudinal research could bring new insights into how opportunity evaluation preferences change over time.

Unit of analysis. The focus was specifically on entrepreneurial opportunities. The characteristics of an entrepreneurial opportunity have an influence on which rules are applied in order to evaluate it (Williams & Wood, 2015). While the structure of the framework does look promising for other kinds of opportunities, such as strategic opportunities, its evaluation rules are likely to differ. Researching

the applicability of this framework for other kinds of opportunities can be helpful for further developing the theoretical underpinnings of the framework and the application limitations.

Sample. The evaluation framework is heavily dependent on the individual's experiences and knowledge base, resulting in a highly personal and subjective considerations and decision-making. Still it did not result in very different attractiveness ratings of the scenarios in this study. This then could indicate that students with no or limited entrepreneurial experience are more similar to each other than would be expected from extant literature. Future research, using more or different evaluation rules, can check whether this is true or not.

This framework is oriented towards entrepreneurs and their opportunity evaluations. However entrepreneurs are not the only ones evaluating entrepreneurial opportunities. Large companies (to grow further) and venture capitalist (as capital suppliers) evaluate opportunities as well. Their view on opportunities, from their own backgrounds and goals, and their opportunity evaluations are most likely different from entrepreneurs (Eisenhardt & Bourgeois, 1988; Macmillan, Siegel, & Narasimha, 1985). Research on the content of their evaluation rules seems a fruitful avenue for further development of the framework.

As always, additional research with larger sample sizes would be useful to validate the findings from this study.

Evaluation rules. The evaluation framework in this study focuses only on characteristics of the opportunity itself, omitting other potentially important aspects. Entrepreneurship research has determined three general categories of characteristics which are relevant in opportunity evaluations (Papadakis et al., 1998; Williams & Wood, 2015):

1. Environmental context: e.g. window of opportunity, number of alternative opportunities, industry rates, technological change, market dynamics, competition, or firm strategy.
2. Opportunity characteristics: e.g. magnitude of value, novelty, lead time, or loss perception.
3. Individual differences: e.g. affect, emotions, illusion of control, fear of failure, prior knowledge, education, risk propensity, or risk perception.

Thus, when evaluating an entrepreneurial opportunity, plenty more factor could play a role in judging the opportunity attractiveness. To further develop the framework, in order to understand opportunity evaluations better and give it more predictive power, more evaluation rules will have to be studied.

Differences in prior experiences and knowledge influence decision-making (Baron & Ensley 2006; Wood & Williams 2014), leading to different opportunity evaluations. Which experiences lead to which preferences in opportunity evaluations (Gruber et al., 2015)? While theory tells us that certain evaluation rules are important, more empirical work is still needed to determine which and when specific evaluation rules are relevant and useful in the opportunity evaluations.

While individuals can have the same set of evaluation rules, their rule content can substantially differ. As a consequence of prior experiences and knowledge, personal characteristics and the specific opportunity at hand, the applied rule content is highly idiosyncratic, leading to potentially large differences in the degree of attractiveness. More research into the details of individuals' rule content needs to be done for a fuller and deeper understanding of opportunity evaluations.

Furthermore, individuals can have a large total set of evaluation rules, but only utilize a small subset for a specific opportunity evaluation (Huber, Wittink, Johnson, & Miller, 1992). When which rules are relevant for an opportunity is also an interesting direction for future research.

Linking specific evaluation rules to organizational success can be a promising research path as well. Because a large amount of new ventures fail, especially new ventures started by novice entrepreneurs (Azoulay & Shane, 2001), improving the survival and success of the firm has become an important goal of Entrepreneurship research. Certain rules can be more effective than others, leading to higher survival and success rates, possibly creating best practices in the evaluation process.

Independent variables. Prior research found Novelty to be an important factor among novice entrepreneurs in judging the attractiveness of an entrepreneurial opportunity (Baron & Ensley, 2006). This study found Novelty to be the least important factor of the three, which contrast the findings by Baron & Ensley. Does Novelty seem artificially low because only three independent variables were researched in this study? Or does a new technology make a large impression on novice entrepreneurs, which then makes them value its novelty very highly? This is an interesting venue to pursue in future research.

Risk in entrepreneurship can be operationalized in other ways than Worst-case Scenario (i.e. the magnitude), such as performance variability and unpredictability (Bromiley, 1991), unpredictability of returns (Janney & Dess, 2006), failure to meet targets (March & Shapira, 1987), or unknowable supply or demand (Sarasvathy et al., 2003), depending on the meaning and the source of the risk. The different interpretations of risk can have different effects on the opportunity attractiveness or even opposite effects, like entrepreneurs preferring low variability but also high magnitude (i.e. more potential gains) (Mullins & Forlani, 2005). The influences of different interpretations of opportunity risks have to be research further.

Dependent variable. In this study the dependent variable Opportunity Attractiveness was operationalized as the degree of viability of creating a new business based on the described entrepreneurial opportunity and the additional scenario information. This practical definition makes it realistic but could unintentionally influence the opportunity evaluation by also introducing unseen or unconscious personal and situational factors that are beyond the scope and control of this conjoint experiment. Future research should be aware of this potential problem and should examine these influences. Moreover, Opportunity Attractiveness can be operationalized in other

ways, such as the degree of desirability and feasibility (Dimov, 2010; Tumasjan et al., 2013), how likely would you be to exploit this opportunity (Baker et al., 2003), or degree of desire to pursue the idea further (Gupta et al., 2014). These new definitions could impact the ratings given to the opportunity attractiveness and future research can look into this.

Setting. Only students from the University of Twente participated in this study. As the evaluation framework depends heavily on the knowledge and experience of the decision-maker, other education programs and local culture (e.g. local knowledge and attitudes) could have an influence on the opportunity evaluations. Future research should therefore validate the results at other universities in the Netherlands and also research university students in other countries.

5.6 Conclusion

The research goal of this thesis was to determine which individuals value which evaluation rules when assessing the attractiveness of entrepreneurial opportunities. Based on extant literature three evaluation rules (Novelty, Resource Efficiency & Worst-case Scenario) were determined to be important in judging the attractiveness, which subsequently lead to the first research question: '*How important do individuals find each of the three evaluation rules for determining the opportunity attractiveness?'*. The main results show that all three evaluation rules played an important role in determining the opportunity attractiveness, however not all evaluation rules had equal importance. Resource Efficiency was found to be the most important factor for determining the opportunity attractiveness. Worst-case Scenario was a close second and finally Novelty was found to be the least important factor in this study. Furthermore while Worst-case Scenario was an important factor in judging the attractiveness, it was not so influential that it mitigated the positive effects of the other two evaluation rules.

The opportunity evaluation can be influenced by many factors, for example prior general knowledge (Haynie et al., 2009; Wood & Williams, 2014), prior entrepreneurial experiences (Baron & Ensley, 2006; Shane, 2000), or prior specific knowledge (Haynie et al., 2009; J. R. Mitchell & Shepherd, 2010). These findings lead to the second research question: '*Do different individuals find different evaluation rules to be more important?*'. The conjoint analysis resulted in several significant interactions effects, thus showing differences in the evaluation rules between individuals.

Education was found to give interaction effects. More specifically, the relationship between Resource Efficiency and Opportunity Attractiveness became less positive when students did a non-technical study, as well as the relationship between Worst-case Scenario and Opportunity Attractiveness became less negative when students did a non-technical study. The control variable Gender resulted in a significant interaction: the relationship between Resource Efficiency and Opportunity Attractiveness became less positive when students were female. Analysis of the

control variable Prior Knowledge of the opportunity also showed one significant interaction effect, namely the relation between Resource Efficiency and Opportunity Attractiveness is more positive when Prior Knowledge is high. The respondents with entrepreneurial experience did not significantly evaluate the opportunity scenarios differently than the respondents without entrepreneurial experience.

To fully answer the second research question: '*Do different individuals find different evaluation rules to be more important?',* it can be concluded that differences between different university students do exist, yet only limitedly. Although the evaluation rules are heavily dependent on the individual's experiences and knowledge base (Baron & Ensley, 2006; Williams & Wood, 2015), which therefore leads to highly subjective opportunity evaluations, it did not result in very different Opportunity Attractiveness ratings in this study.

This study has hereby provided new information on the initial evaluation rules, by researching how much individuals with no or limited entrepreneurial experience value each evaluation rule. These new insights provide better understandings of opportunity evaluations, an important topic in Entrepreneurship research (Eckhardt & Shane, 2003) and an important ability of the entrepreneur (Stevenson & Gumpert, 1985) since the opportunity evaluations are the key to success in the opportunity identification process (Hills 1995).

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APPENDIX

Appendix 1. Questionnaire

UNIVERSITY OF TWENTE.

Evaluating entrepreneurial opportunities:

RATE THE ENTREPRENEURIAL OPPORTUNITY

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Questionnaire

Section A. Information

Instructions

We want to research when a business opportunity is considered attractive. Choosing the right opportunity to exploit is a crucial task of the entrepreneur for the survival and success of his/her firm, and therefore we want to analyze what characteristics make an attractive opportunity. This study focusses on university students and their preferences.

First, you will be given a description of an entrepreneurial business opportunity. Next is the actual task: rating the attractiveness of eleven scenarios. Each scenario consists of three opportunity characteristics (Novelty, Resource Efficiency, and Worst-case Scenario) with varying values and you are asked to rate how attractive each characteristics-combination is to you personally on a 7-point scale, ranging from 1 (Not at all attractive) to 7 (Highly attractive). For this study high opportunity attractiveness means high viability of creating a new business based on the described opportunity in the scenario. Finally, you are asked six general background questions.

When rating the attractiveness, you are to assume you are an actual entrepreneur and this is a real business situation. You can also assume you have sufficient skills and resources to pursue the opportunity if you choose to do so.

Participation in this questionnaire is individual and anonymous. All the information and data will be treated confidentially and will only be used for this specific study. The findings will be reported in an aggregated form. Furthermore, your participation in this questionnaire is voluntarily and you can withdraw at any time if you wish to do so. It will take roughly 10 minutes to complete this questionnaire.

Description of the entrepreneurial opportunity

* Please read the following description. It is meant to place the scenarios into context. Fully understanding the technology or memorizing all details is not necessary. *

Columbia University has announced the identification of a business opportunity based on the development of a new technology that revolutionizes the way materials are coated or plated to improve electrical conductivity and to make it easier to coat non-conductive materials.

Materials often need to be coated or plated with metal layers to improve electrical conductivity and this is achieved via an electroplating process. This process involves passing electrical current between electrodes which results in the deposit of metal ions on the material. Non-conductive materials prevent ions from reaching the native surface and thus metals such as aluminum and

tungsten are very difficult to coat. Existing techniques to coat such metals require numerous and expensive steps.

To solve the problem and meet the needs of the market, Columbia researchers have developed a new technology called In-Situ Plating designed to improve the process of coating non-conductive materials. The new process involves first etching the oxide film to clean up the surface of the material and then applying traditional electroplating techniques to the desired metal. The new cleaning/etching process can be combined with electroplating in the same system which leads to a significant reduction in processing steps. This leads to major reductions in processing time, raw materials, and physical space required for plating lines and results in important cost saving benefits.

In-Situ Plating is a business opportunity that is desirable because it improves the finished product and reduces production costs. In-Situ Plating is feasible because it builds on existing electroplating technology but is innovative and provides a problem-based solution. This reduces opportunity related risk and increases expectations that the business opportunity can quickly generate cash flows.

Section B. Task

Rate the entrepreneurial opportunity

The In-Situ Plating technology has to be judged on three important characteristics: 1. Novelty, 2. Resource Efficiency, and 3. Worst-case Scenario. Each scenario consists of a different combination of characteristic values. Please rate how attractive each scenario is to you specifically.

Judge each scenario independently. You are not allowed to refer back to previous scenarios and ratings.

Scenario 1.	
Characteristic	*Meaning*
Novelty is **low**	In-Situ Plating technology is *not considered extremely new or original* by industry experts.
Resource Efficiency is **high**	The resources required to implement In-Situ Plating have many potential uses and experts *consider In-Situ Plating to be the first and best use* of the production resources.
Worst-case Scenario is **mild**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose a modest amount that can be readily handled*.
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 2.	
Characteristic	*Meaning*
Novelty is **high**	In-Situ Plating technology *is considered extremely new or original* by industry experts.
Resource Efficiency is **low**	The resources required to implement In-Situ Plating have many potential uses and experts *do not consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **mild**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose a modest amount that can be readily handled*
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 3.	
Characteristic	*Meaning*
Novelty is **high**	In-Situ Plating technology *is considered extremely new or original* by industry experts.
Resource Efficiency is **high**	The resources required to implement In-Situ Plating have many potential uses and experts *consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **mild**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose a modest amount that can be readily handled.*
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 4.	
Characteristic	*Meaning*
Novelty is **high**	In-Situ Plating technology *is considered extremely new or original* by industry experts.
Resource Efficiency is **high**	The resources required to implement In-Situ Plating have many potential uses and experts *consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **severe**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose everything*.
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 5.	
Characteristic	*Meaning*
Novelty is **low**	In-Situ Plating technology is *not considered extremely new or original* by industry experts.
Resource Efficiency is **low**	The resources required to implement In-Situ Plating have many potential uses and experts *do not consider In-Situ Plating to be the first and best use* of the production resources.
Worst-case Scenario is **mild**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose a modest amount that can be readily handled.*
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 6.	
Characteristic	*Meaning*
Novelty is **high**	In-Situ Plating technology *is considered extremely new or original* by industry experts.
Resource Efficiency is **high**	The resources required to implement In-Situ Plating have many potential uses and experts *consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **mild**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose a modest amount that can be readily handled.*
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 7.	
Characteristic	*Meaning*
Novelty is **low**	In-Situ Plating technology is *not considered extremely new or original* by industry experts.
Resource Efficiency is **high**	The resources required to implement In-Situ Plating have many potential uses and experts *consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **severe**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose everything*.
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 8.	
Characteristic	*Meaning*
Novelty is **low**	In-Situ Plating technology is *not considered extremely new or original* by industry experts.
Resource Efficiency is **low**	The resources required to implement In-Situ Plating have many potential uses and experts *do not consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **severe**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose everything*.
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 9.	
Characteristic	*Meaning*
Novelty is **high**	In-Situ Plating technology *is considered extremely new or original* by industry experts.
Resource Efficiency is **low**	The resources required to implement In-Situ Plating have many potential uses and experts *do not consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **severe**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose everything*.
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 10.	
Characteristic	*Meaning*
Novelty is **high**	In-Situ Plating technology *is considered extremely new or original* by industry experts.
Resource Efficiency is **low**	The resources required to implement In-Situ Plating have many potential uses and experts *do not consider In-Situ Plating to be the first and best use* of production resources.
Worst-case Scenario is **mild**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose a modest amount that can be readily handled.*
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Scenario 11.	
Characteristic	*Meaning*
Novelty is **low**	In-Situ Plating technology is *not considered extremely new or original* by industry experts.
Resource Efficiency is **high**	The resources required to implement In-Situ Plating have many potential uses and experts *consider In-Situ Plating to be the first and best use* of the production resources.
Worst-case Scenario is **severe**	If creating a venture based on In-Situ Plating results in production problems or is not well received by the market, the worst-case scenario is that the entrepreneur will *likely lose everything*.
Based on the characteristics described above, how attractive is the opportunity for you specifically?	
← Not at all attractive	Highly attractive →
1 2 3 4 5 6 7	

Background questions

1. Age: ……
2. Gender: ……
3. Study: ……
4. Bachelor or Master: ……
5. An entrepreneur is an individual who is self-employed, or has started or run at least one business. How many years of entrepreneurial experience do you have (number of practiced years)? ……
6. Did you have any prior knowledge of the entrepreneurial opportunity In-Situ Plating? Please rate.

No prior knowledge at all				High level of prior knowledge		
1	2	3	4	5	6	7

Thank you for your cooperation.

Appendix 2. Pre-test questionnaire ratings

Response reliability testing in Excel 2016, using Spearman's rho.

Table 8. Scenario nr 2. ratings

1st ratings	*Repeat ratings*	*Ranking 1st ratings*	*Ranking repeat ratings*
7	7	3,5	4
7	7	3,5	4
6	6	13	13
6	6	13	13
7	7	3,5	4
7	7	3,5	4
6	6	13	13
6	6	13	13
6	6	13	13
5	5	20	19,5
6	7	13	4
6	6	13	13
7	7	3,5	4
7	7	3,5	4
6	5	13	19,5
6	6	13	13
6	6	13	13
6	6	13	13
6	6	13	13
6	6	13	13
		Spearman's rho	0,876

Table 9. Scenario nr. 4 ratings

1st ratings	*Repeat ratings*	*Ranking 1st ratings*	*Ranking repeat ratings*
2	2	18	18
5	5	2	1,5
4	4	6,5	6,5
4	4	6,5	6,5
4	4	6,5	6,5
3	3	12,5	13
2	2	18	18
4	4	6,5	6,5
3	3	12,5	13
4	2	6,5	18
2	2	18	18
3	4	12,5	6,5
2	3	18	13
3	3	12,5	13
3	5	12,5	1,5
5	4	2	6,5
5	4	2	6,5
4	2	6,5	18
		Spearman's rho	0,550

Table 10. Scenario nr. 5 ratings

1st ratings	*Repeat ratings*	*Ranking 1st ratings*	*Ranking repeat ratings*
4	4	5	5
2	2	16,5	17,5
3	3	11,5	11,5
4	4	5	5
4	4	5	5
4	4	5	5
4	3	5	11,5
3	3	11,5	11,5
3	3	11,5	11,5
4	2	5	17,5
1	3	19,5	11,5
2	2	16,5	17,5
3	4	11,5	5
3	4	11,5	5
5	5	1	1
2	2	16,5	17,5
3	2	11,5	17,5
2	2	16,5	17,5
		Spearman's rho	0,629

Appendix 3. Stata output

1. Stata summary

Table 11. Summary of variables

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Respondent	552	35	19.93456	1	69
Scenario	552	4.5	2.293366	1	8
Novelty	552	1.5	.5004535	1	2
Resource	552	1.5	.5004535	1	2
Worstcase	552	1.5	.5004535	1	2
Opp_Att	552	3.483696	1.813367	0	7
Age	552	23.17391	2.234568	18	28
Gender	552	1.42029	.4940531	1	2
Study	552	1.550725	.4978715	1	2
Program	552	1.478261	.4999803	1	2
Entrepr_Exp	552	.9710145	2.072872	0	10
Prior_know	552	1.550725	1.044022	1	6

2. Stata rank-ordered logistic regression results

Model 1: *Main effects*

Table 12. Main effects

Opp_Att	*Coef.*	*Std. Err.*	*z*	*P>|z|*	*[95% Conf.*	*Interval]*
Novelty	1.342712	0.1328439	10.11	0.000	1.082342	1.603081
Resource	2.071305	0.1550497	13.36	0.000	1.767413	2.375196
Worstcase	-1.947968	0.151004	-12.90	0.000	-2.243931	-1.652006

. rologit Opp_Att Novelty Resource Worstcase, group(Respondent)

Iteration 0: log likelihood = -571.96427
Iteration 1: log likelihood = -378.81382
Iteration 2: log likelihood = -366.07453
Iteration 3: log likelihood = -365.72504
Iteration 4: log likelihood = -365.72461
Refining estimates:
Iteration 0: log likelihood = -365.72461

Rank-ordered logistic regression	Number of obs = 552
Group variable: Respondent	Number of groups = 69
Ties handled via the exactm method	Obs per group:
	min = 8
	avg = 8.00
	max = 8
	LR chi2(3) = 412.48
Log likelihood = -365.7246	Prob > chi2 = 0.0000

Model 2. *Interaction effects*

Table 13. Worst-case Scenario as an interaction

Opp_Att	*Coef.*	*Std. Err.*	*z*	*P>|z|*	*[95% Conf.*	*Interval]*
Novelty	1.401655	0.3881902	3.61	0.000	0.640817	2.162494
Resource	2.362648	0.4235277	5.58	0.000	1.532549	3.192747
Worstcase	-1.576194	0.6397127	-2.46	0.014	-2.830008	-0.322380
Worst_Nov	-0.036816	0.2506255	-0.15	0.883	-0.528033	0.454401
Worst_Res	-0.202013	0.2713439	-0.74	0.457	-0.733837	0.329812

. generate Worst_Nov = Worstcase*Novelty

. generate Worst_Res = Worstcase*Resource

. rologit Opp_Att Novelty Resource Worstcase Worst_Nov Worst_Res, group(Respondent)

Iteration 0: log likelihood = -571.96427
Iteration 1: log likelihood = -383.69649
Iteration 2: log likelihood = -366.04417
Iteration 3: log likelihood = -365.45111
Iteration 4: log likelihood = -365.44921
Iteration 5: log likelihood = -365.44921
Refining estimates:
Iteration 0: log likelihood = -365.44921

Rank-ordered logistic regression	Number of obs = 552
Group variable: Respondent	Number of groups = 69
Ties handled via the exactm method	Obs per group:
	min = 8
	avg = 8.00
	max = 8
	LR chi2(4) = 413.03
Log likelihood = -365.4492	Prob > chi2 = 0.0000

Model 3. *Moderator effects*

Table 14. Education as a moderator

Opp_Att	*Coef.*	*Std. Err.*	*z*	*P>|z|*	*[95% Conf.*	*Interval]*
Novelty	1.362222	0.4453442	3.06	0.002	.4893633	2.235081
Resource	3.167925	0.5567201	5.69	0.000	2.076774	4.259077
Worstcase	-2.945839	0.5376594	-5.48	0.000	-3.999632	-1.892046
c.Study# c.Novelty	-0.0079793	0.27004	-0.03	0.976	-0.5372479	0.5212893
c.Study# c.Resource	-0.6809666	0.325805	-2.09	0.037	-1.319533	-0.0424005
c.Study# c.Worstcase	0.6163257	0.3159939	1.95	0.051	-0.003011	1.235662

```
. rologit Opp_Att Novelty Resource Worstcase c.Study#c.(Novelty Resource Worstcase),
group(Respondent)
Iteration 0:   log likelihood = -571.96427
Iteration 1:   log likelihood = -376.86606
Iteration 2:   log likelihood = -362.9269
Iteration 3:   log likelihood = -362.38256
Iteration 4:   log likelihood = -362.38031
Iteration 5:   log likelihood = -362.38031
Refining estimates:
Iteration 0:   log likelihood = -362.38031

Rank-ordered logistic regression              Number of obs = 552
Group variable: Respondent                    Number of groups = 69
Ties handled via the exactm method            Obs per group:
                                                          min = 8
                                                          avg = 8.00
                                                          max = 8
                                              LR chi2(6) = 419.17
Log likelihood = -362.3803                    Prob > chi2 = 0.0000
```

Model 4. *Moderator effects*

Table 15. Entrepreneurial Experience as a moderator

Opp_Att	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Novelty	1.243808	0.1455773	8.54	0.000	0.9584817	1.529134
Resource	2.047414	0.1708907	11.98	0.000	1.712475	2.382354
Worstcase	-2.010293	0.1684249	-11.94	0.000	-2.3404	-1.680186
c.Entrepr_Exp#						
c.Novelty	0.1162221	0.0752878	1.54	0.123	-0.0313392	0.2637834
c.Entrepr_Exp#						
c.Resource	0.0398364	0.0782397	0.51	0.611	-0.1135106	0.1931833
c.Entrepr_Exp#						
c.Worstcase	0.0535944	0.0703717	0.76	0.446	-0.0843317	0.1915205

. rologit Opp_Att Novelty Resource Worstcase c.Entrepr_Exp#c.(Novelty Resource Worstcase), group(Respondent)

Iteration 0: log likelihood = -571.96427
Iteration 1: log likelihood = -376.7839
Iteration 2: log likelihood = -363.72537
Iteration 3: log likelihood = -363.34734
Iteration 4: log likelihood = -363.34677
Refining estimates:
Iteration 0: log likelihood = -363.34677

Rank-ordered logistic regression	Number of obs = 552
Group variable: Respondent	Number of groups = 69
Ties handled via the exactm method	Obs per group:
	min = 8
	avg = 8.00
	max = 8
	LR chi2(6) = 417.23
Log likelihood = -363.3468	Prob > chi2 = 0.0000

Model 5. *Control*

Table 16. Gender as a control

Opp_Att	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Novelty	1.801599	.4158076	4.33	0.000	.9866311	2.616567
Resource	3.080739	.494966	6.22	0.000	2.110624	4.050855
Worstcase	-2.400675	.4704451	-5.10	0.000	-3.322731	-1.47862
c.Gender# c.Novelty	-0.3105579	0.2682666	-1.16	0.247	-0.8363507	0.2152349
c.Gender# c.Resource	-0.6889988	0.3123624	-2.21	0.027	-1.301218	-0.0767798
c.Gender# c.Worstcase	0.3081048	0.3050542	1.01	0.312	-0.2897905	0.906

. rologit Opp_Att Novelty Resource Worstcase c.Gender#c.(Novelty Resource Worstcase), group(Respondent)
Iteration 0: log likelihood = -571.96427
Iteration 1: log likelihood = -377.27773
Iteration 2: log likelihood = -363.6577
Iteration 3: log likelihood = -363.17469
Iteration 4: log likelihood = -363.17324
Iteration 5: log likelihood = -363.17324
Refining estimates:
Iteration 0: log likelihood = -363.17324

Rank-ordered logistic regression	Number of obs = 552
Group variable: Respondent	Number of groups = 69
Ties handled via the exactm method	Obs per group:
	min = 8
	avg = 8.00
	max = 8
	LR chi2(6) = 417.58
Log likelihood = -363.1732	Prob > chi2 = 0.0000

Model 6. *Control*

Table 17. Prior Knowledge as a control

Opp_Att	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Novelty	1.379361	0.2380994	5.79	0.000	0.9126946	1.846027
Resource	1.590306	0.2934689	5.42	0.000	1.015117	2.165494
Worstcase	-1.861301	0.2782335	-6.69	0.000	-2.406629	-1.315974
c.Prior_know# c.Novelty	-0.0183407	0.1273389	-0.14	0.885	-0.2679203	0.2312389
c.Prior_know# c.Resource	0.3238886	0.1750893	1.85	0.064	-0.0192802	0.6670575
c.Prior_know# c.Worstcase	-0.0687086	0.1551932	-0.44	0.658	-0.3728816	0.2354645

. rologit Opp_Att Novelty Resource Worstcase c.Prior_know#c.(Novelty Resource Worstcase), group(Respondent)
Iteration 0: log likelihood = -571.96427
Iteration 1: log likelihood = -376.95312
Iteration 2: log likelihood = -363.71818
Iteration 3: log likelihood = -363.30858
Iteration 4: log likelihood = -363.30769
Iteration 5: log likelihood = -363.30769
Refining estimates:
Iteration 0: log likelihood = -363.30769

Rank-ordered logistic regression	Number of obs = 552
Group variable: Respondent	Number of groups = 69
Ties handled via the exactm method	Obs per group:
	min = 8
	avg = 8.00
	max = 8
	LR chi2(6) = 417.31
Log likelihood = -363.3077	Prob > chi2 = 0.0000