

# ENTREPRENEURSHIP IN NORWAY AFTER THE OIL PRICE CRASH OF 2014

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## ABSTRACT

Since 2014 the focus of promoting entrepreneurship raised in order to fill the increasing unemployment rate in Norway. This was due to the decrease in the oil price that put several oil & gas projects to a lethargic mode worldwide. This implied that former oil workers stepped into the startup scene with their specialized skills in specific areas mostly applied to the oil business. In some cases they started businesses in technical areas related to their specialties, but in other cases they changed focus into different industries. The question then arises: How do these individuals start their businesses? What entrepreneurship model do they follow?

To answer these questions, firstly it had to be described the decision environment that they experience since it influences how does an entrepreneur take decisions. Starting a new venture encompasses high uncertainty, where stakes are high, time pressures are immense and there is emotional investment. With the decision-making environment stated, the next step taken was to measure the presence of the chosen entrepreneurship models for this research: Bricolage, Effectuation and Cognitive Adaptability.

The study prepared a questionnaire to estimate these three entrepreneurship models plus decision-making environment, that was sent to Norwegian companies that got established since 2015. The results indicated that Bricolage and Cognitive Adaptability are mostly used by former oil workers. The Decision-making environment amongst them is considered “regularly calm”, meaning that uncertainty levels are not high.

The obtained results were also expressed by Industry, Geographical Centrality (defined by Statistics Norway) and Competence Intensity.

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I don't want to forget to dedicate this effort to the person I miss the most and I will never see again in this life, my gramma. I'm sure she helped me from above with all my endeavors.

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Author,

Juan Carlos Maita Pozo

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## **LIST OF ABBREVIATIONS**

CA: Cognitive Adaptability

CI: Competence Intensity

DM: Decision Making

DME: Decision Making Environment

O&G: Oil and Gas

Q#: Question number

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## INTRODUCTION

Over 40 000 jobs have disappeared in the oil industry since 2014. Oil production on the Norwegian continental shelf is reduced and the costs have increased. Investments in the oil & gas sector has also decreased strongly (NRK, 2017). Several oil “giant” companies have abandoned the Norwegian continental shelf (Upstream, 2017) and if bigger projects with improved performance meaning lower costs are not achieved, the Norwegian oil industry will not be competitive in the long term. For the short term, it was a struggle for the Norwegian government to deal with the increased unemployment and many former oil workers had to reinvent themselves for finding new jobs and/or migrate to other regions/countries. With this, other industries got affected regionally, such as West and South Norway, since the oil business had an important role in those communities. A way to confront this problem is to promote entrepreneurship in the country, since the Norwegian startup scene is still young and the technical potential is present.

More than 3 years has passed since the oil price crash started and new companies have been established with former oil & gas workers, but in some of the cases they had a focus outside the oil business. The intriguing part is to understand how they work with their new venture, which problems they face and what are the patterns of their specific mindset. This defines the research question: How do former oil & gas professionals start their businesses (do entrepreneurship) after the oil price crisis in Norway of 2014?

For answering this, a questionnaire was crafted for contacting entrepreneurs that match the criteria of being former O&G workers for determining which entrepreneurship approach they work with, determining also the new venture’s industry category. The considered

entrepreneurship models in this research proposal are Bricolage, Effectuation and Cognitive Adaptability.

Everybody thinks differently, peculiarly entrepreneurs than non-entrepreneurs. Moreover, an entrepreneur thinks and acts according to the tasks and decision environment. The decision-making environment can have an influence in which entrepreneurship model will be applied, also considering the inherent factors of available resources and network. Industry and location was as well accounted to explore the possible effects of these.

This is an exploratory study, since no hypotheses can have a solid foundation of which entrepreneurship model is used or if the decision-making environment has a decisive role in opting a certain model.

It should be noted that in 2008 was the previous oil price crisis and had repercussions in the Norwegian economy as well, where a previous set of entrepreneurs emerged. The oil price is known to have cycles of 5-6 years and it is always the government's concern of how to diversify the economy for Norway to not be as dependent of the oil price fluctuations, in sort of saying: "find the new oil".

The present work contains a chapter covering the theory framework for this research, followed by the methodology used to attain the required responses through the questionnaire and establishing the analysis method, the limitations of the study are explained in a separate chapter. The results and analysis chapter comes next showing the data report in detail, including frequency distributions and statistical analysis of the variables. Finally, the conclusion chapter shows the most important findings and their relevance.

## **THEORY**

This chapter describes firstly how do entrepreneurs think and the framework of the research. Once it is decided to engage into a new venture, entrepreneurs experience an environment of high uncertainty, that is explained in the second segment. Finally, the used entrepreneurship models in this research are illustrated, specifically Bricolage, Effectuation and Cognitive Adaptability.

### **Entrepreneurial Thinking**

Entrepreneurship plays an important role in the creation and growth of businesses, as well as in the growth and prosperity of nations (Lee & Peterson, 2000). These large-scale outcomes can have quite humble beginnings; entrepreneurial actions begin at a nexus of a lucrative opportunity and an enterprising individual (Venkataraman, 1997). Moreover, given recent trends toward corporate downsizing, the privatization of economies, and global competition based on agility, creativity, and innovation, both popular enthusiasm and academic research are increasingly stressing the need to establish a global business climate whereby entrepreneurship assumes a prominent role (Birley, MacMillan, & European Foundation for Entrepreneurship, 1992; Covin & Slevin, 1991; Lado & Vozikis, 1997; Morris, 1998).

The consequences of the oil price fall and how businesses have thought in new approaches and individuals stood up to find new ways to use their knowledge, showed that people in Norway, "is used to work harder together when needed", according to Erna Solberg, Prime Minister of Norway (Dagens Næringsliv, 2018). The root of everything are the entrepreneurial opportunities, "those situations in which new goods, services, raw materials and organizing methods can be introduced and sold at greater than their cost of production" (Shane & Venkataraman, 2000). It is important

to point out that entrepreneurial opportunities represent something new (Suddaby, Bruton, & Si, 2015). However, the opportunity itself is worth nothing (B. I. Handleshøyskolen, 2018). It requires an individual or a group to recognize, evaluate and exploit these situations as possible opportunities. This is called entrepreneurial action, through the creation of new products/processes and/or the entry into new markets, which may occur through a newly created organization or within an established organization (Hisrich, Peters, & Shepherd, 2017; Watson, 2013).

Being an entrepreneur is to act on the possibility that one has identified an opportunity worth pursuing (McMullen & Shepherd, 2006; Suddaby et al., 2015). It involves entrepreneurial thinking, which is the individuals' mental processes of overcoming ignorance to decide whether a signal represents an opportunity for someone and/or reducing doubt as to whether an opportunity for someone is also an opportunity for them specifically, and/or processing feedback from action steps taken (Hisrich et al., 2017; Patel & Mehta, 2017).

Entrepreneurs have a different mindset from non-entrepreneurs (Lindberg, Bohman, Hulten, & Wilson, 2017). Furthermore, an entrepreneur in a singular situation may think differently from when confronted with some other task or decision setting. Entrepreneurs must often make decisions in highly uncertain environments where the stakes are high, time pressures are immense, and there is considerable emotional investment (Brozik & Zapalska, 2006; Hisrich et al., 2017). We all think differently in these strained environments than we do when the problem's nature is well understood and we have time and rational procedures at hand to solve it.

### **Decision Making Theory**

Decision-Making (DM) processes can involve many variables, increasing the complexity and difficulty of qualitative and quantitative analysis. The decision-maker is the person, system or organization that makes a decision (Marugán & Márquez, 2015). A decision-maker should have

some personal skills (experience, good judgement, creativity) and other skills supported by existing methods and DM support tools (Taticchi, Garengo, Nudurupati, Tonelli, & Pasqualino, 2014). These DM support systems are used in order to assist decision-makers in choosing between several alternatives and, consequently, to help the decision-maker to decide what alternative is the best (Rezaei, 2015; Talluri, Decampos, & Hult, 2013).

The DM process described in this occasion is focused on a main problem, which represents an undesired event whose occurrence probability needs to be minimized. The logical structure of the main problem is approached by a logical decision tree. Different scenarios can be considered in function of the information available in the DM process (Pliego Marugán, García Márquez, & Lev, 2017):

- DM under certainty: This scenario implies that the decision-maker has a complete information about the problem. The causes, consequences and all the variables of the problem are known.
- DM under risk: A risk environment is considered when some of the information available is stochastic. This will be the scenario considered in this paper.
- DM under uncertainty: In this case, the decision-maker has not a complete information of the problem, or part of the information is missing (Kull, Oke, & Dooley, 2014).

Following the nature of an entrepreneurs' decision-making environment, they must sometimes (1) engage in bricolage, (2) effectuate, and (3) cognitively adapt.

## **Bricolage**

The behavioral theory of “entrepreneurial bricolage” attempts to understand what entrepreneurs do when faced with resource constraints (Senyard, Baker, & Davidsson, 2009). Most research

about bricolage, defined as “making do by applying combinations of the resources at hand to new problems and opportunities” (Baker & Nelson, 2005) and can be contrasted with behaviors that involve seeking new resources to address new situations or opportunities (Duymedjian & Rüling, 2010), has been qualitative and inductive (Garud & Karnøe, 2003). Per se, bricolage refers to the creation of something through a diverse set of means (Jonckheere, 2017), which is a construct used in several completely different fields, ranging from arts, social psychology to IT.

Witell, Gebauer, Jaakkola, Hammedi, Patricio, and Perks (2017) propose four specific bricolage capabilities (addressing resource scarcity actively, making do with what is available, improvising when recombining resources, and networking with external partners) that influence service innovation outcomes in resource-constrained environment.

### ***Bricolage Capabilities***

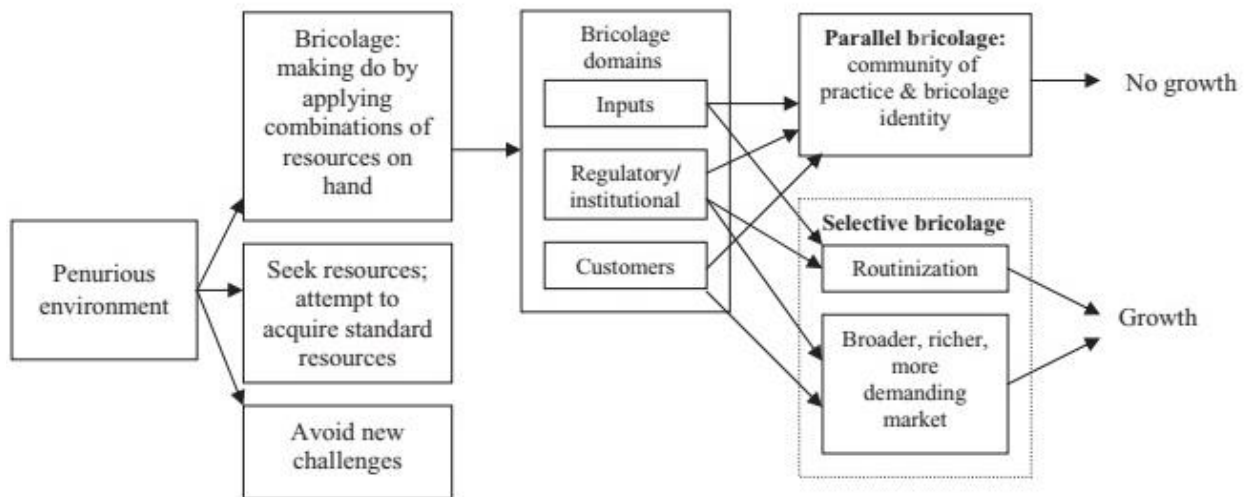
First, organizations can either address resource constraints actively or avoid this challenge. The latter means that organizations engage in avoidance behaviors or escape from acting under the constraints of resource scarcity (Rosenzweig, Grinstein, & Ofek, 2016) by abandoning new opportunities, terminating innovation projects, or exiting markets (Baker & Nelson, 2005).

Second, since acquiring and creating new resources is out of reach in resource-constrained environments, bricolage requires the ability to making do with what resources are available. This can create solutions that are neither perfect nor elegant (Lévi-Strauss, 1966). Nevertheless, such solutions might assist organizations when they face market uncertainties and when they want to test new products and services rather quickly.

Third, bricolage requires the ability to improvise. Improvisation can be viewed as a tactic of the organization to mobilize and combine resources in a novel way (Weick, 1993). Compensation

approaches utilizing other, existing resources that compensate for the missing resources (Rosenzweig et al., 2016). Bricoleurs are seen as thinkers who are able to improve, imagine, combine, and search for new, unexpected resources (Miettinen & Virkkunen, 2005).

Fourth and finally, bricolage requires the ability to network with external partners for better coping with resource constraints (Perry, Chandler, & Markova, 2012). External resources can be accessed in two main ways: by acquiring resources through market transactions, or by mobilizing resources through partnering and collaborating with external organizations (Coviello & Cox, 2006).



**Figure 1:** Bricolage Approach to Entrepreneurship (Baker & Nelson, 2005)

### ***Bricolage effects***

Studying the bricolage effects through descriptive and inductive research on two varieties of newly established firms, nascent firms (pre-operational) and young firms (with less than 4 years of operation), the main effect of bricolage on nascent firm (pre-operational) performance was positive. Bricolage led to the completion of a higher number of gestation activities completed for nascent firms. Also, bricolage appears to lead to lower reported sales for new young firms. On the

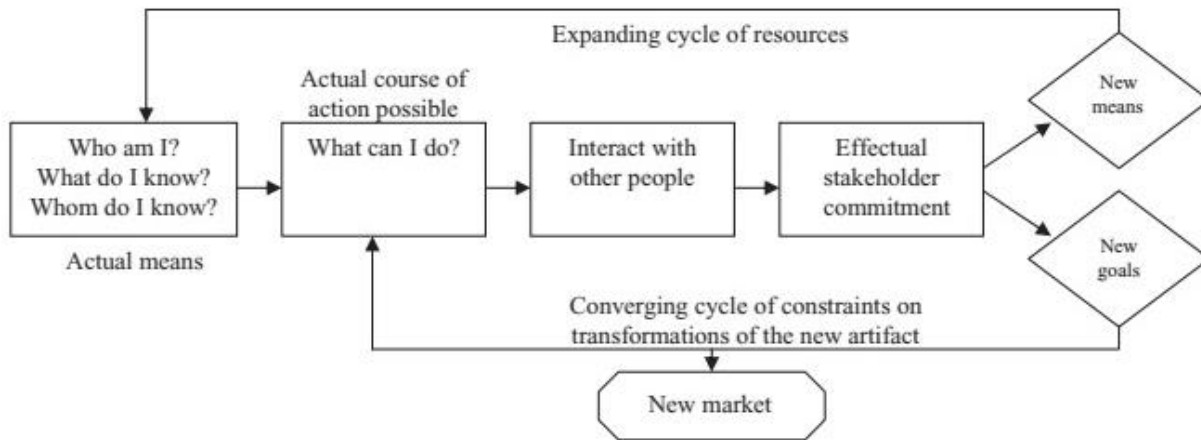
other hand, innovativeness did not have a moderating effect on the impact of bricolage in nascent firms; innovativeness did, however, moderate the bricolage-performance relationship in young firms (Senyard et al., 2009). Being innovativeness an attribute or property of actions and outcomes that create a useful novelty, intrinsically linked to the nature of innovation (DeGraff & Nathan-Roberts, 2011).

Senyard (2015) found that both relationship affiliations and functionally diverse teams positively moderate the relationship between bricolage and young firm sales. This is accordant with the work of Brannon, Wiklund, and Haynie (2013) who suggests, within team literature, that pre-existing relationships matter a great deal, and that personal relationships, have a strong effect on performance in the initial stages of a firm's development.

## **Effectuation**

Effectuation refers to a set of heuristics identified with expert entrepreneurial decision making (Sarasvathy, 2013). The heuristics are nonpredictive in that they do not require the decision maker to rely on information about the future. Instead they allow effectuators to act based on things within their control to reshape their environments and build networks of self-selected stakeholders (Sarasvathy, 2001). Effectual heuristics thus find their greatest use in people-centric, highly uncertain, information-poor, ambiguity-rich decision domains (Sarasvathy, 2013). Effectual heuristics differ from the more familiar causal methods in the emphasis on action rather than explanation, human agency rather than physical agency, and a synthetic rather than analytic approach (Sarasvathy, 2013).





**Figure 2:** *Effectual Approach to Entrepreneurship (Sarasvathy & Dew, 2005)*

The five basic principles of effectuation can be presented as straight inversions of predictive strategies as follows (Sarasvathy, 2013):

The Bird-In-Hand Principle: Start with a set of means to create a possible result. Since other stakeholders also bring their means to the table, this often results in a series of accidental, ad-hoc, and serendipitous events producing a novel effect, both unanticipated and/or unimagined. This inverts the idea that entrepreneurs have to begin with clear goals and/or predefined visions of opportunities and then search for ways and means to achieve those goals or discover and realize the opportunities (Sarasvathy, 2013).

The Affordable Loss Principle: Invest only what one can afford to lose and then iteratively push to expand the potential of what has just been made possible (Sarasvathy, 2013). Affordable loss is a failure-management principle that heartens a bias for action rather than analysis. This is in strong contrast to causal methods of opportunity assessment that include predicting future cash flows and seeking to maximize expected revenues.

The Crazy Quilt Principle: Co-create the enterprise with stakeholders who self-select into the process. This points out a different view of both stakeholders and entrepreneurs. Rather than

viewing entrepreneurs as charismatic visionaries and stakeholders as followers, this principle sees the entrepreneurial enterprise as a patchwork effort, where talents, visions, means, and preferences get blended into a one-of-a-kind enterprise (Sarasvathy, 2013). In fact, in the effectual process, the person who chooses to come on board determines what gets built, and not vice versa (Fisher, 2012).

Lemonade Principle: The effectual process is dynamic, interactive, and iterative, that also assumes and propels unpredictability in the system (Sarasvathy, 2013). Therefore, effectuation involves embracing and leveraging surprises rather than planning and seeking to avoid them. Even negative surprises feed back into the bird-in-hand principle to become inputs into the venture creation process (Sarasvathy, 2001). The lemonade principle encourages the actor to reevaluate the situation rather than adjust to it.

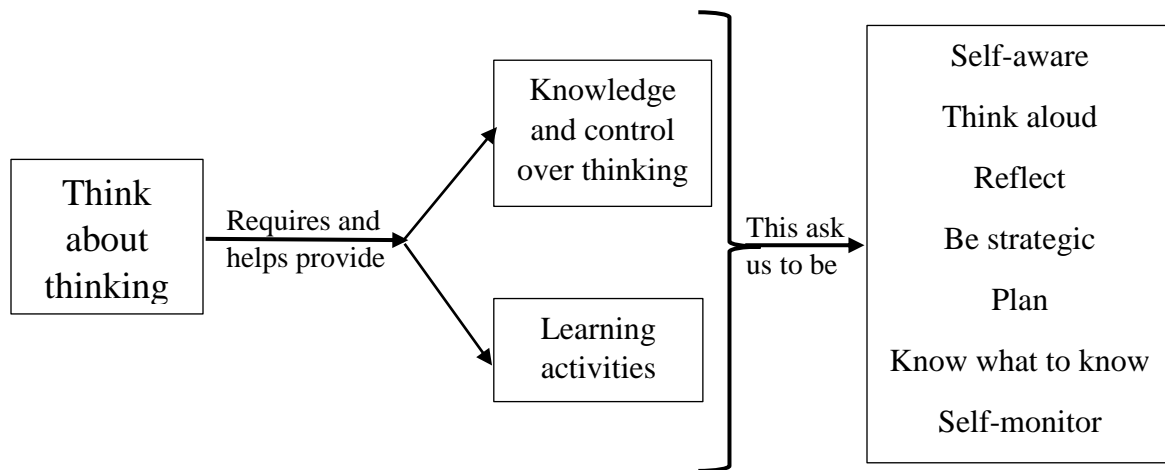
Pilot-In-The-Plane Principle: This principle spells out the logic of nonpredictive control at the core of effectuation, emphasizes the fact that the future is not exogenous to human action, that is, history is not on autopilot. Because human action is capable of intervening and restyling trends, the pilot-in-the-plane principle argues for not trusting “inevitable” trends. Instead, when an effectuator encounters a probability estimate, he or she looks for which conditioning assumptions to reify or falsify, not to simply “update” her priors. Effectual logic, therefore, is not Bayesian—a calculus built on effectual probability would be a control engine rather than an inference engine (Sarasvathy, 2013).

### **Cognitive Adaptability**

Cognitive adaptability describes the extent to which entrepreneurs are dynamic, flexible self-regulating, and engaged in the process of generating multiple decision frameworks focused on sensing and processing changes in their environments and then acting on them (Hisrich et al., 2017). Decision frameworks are organized on knowledge about people and situations that are used

to help someone make sense of what is going on (Haynie & Shepherd, 2009). Cognitive adaptability is reflected in an entrepreneur's metacognitive awareness, that is, the ability to reflect upon, understand, and control one's thinking and learning (Schraw & Dennison, 1994). Specifically, metacognition describes a higher-order cognitive process that serves to organize what individuals know and recognize about themselves, tasks, situations, and their environments to promote effective and adaptable cognitive functioning in the face of feedback from complex and dynamic environments (Weinert & Kluwe, 1987).

Put simply, it requires us to "think about thinking which requires, and helps provide, knowledge and control over our thinking and learning activities it requires us to be self-aware, think aloud, reflect, be strategic, plan, have a plan in mind know what to know, and self-monitor (Guterman, 2002). We can achieve this by asking ourselves a series of questions that relate to (1) comprehension, (2) connection, (3) strategy and (4) reflection (Mevarech & Kramarski, 2003).



**Figure 3:** Cognitive Adaptability Approach of Entrepreneurship

1. Comprehension questions are intended to increase entrepreneurs' understanding of the nature of the environment before they begin to address an entrepreneurial challenge, whether it be a change in the environment or the assessment of a potential opportunity.

Understanding arises from recognition that a problem or opportunity exists, the nature of that situation, and its implications. In general, the questions that stimulate individuals to think about comprehension include: What is the problem all about? What are the meanings of the key concepts? Precisely to entrepreneurs, the questions are more related to be about: What is this market all about? What is this technology all about? What do we want to achieve by creating this new firm? What are the key elements to effectively pursuing this opportunity?

2. Connection tasks are designed to stimulate entrepreneurs to think about the current situation in terms of similarities to and differences from situations previously faced and solved. Generally, connection tasks focus on questions like: How is this problem similar to problems I have already solved? How is this problem different from what I have already solved? Specific to entrepreneurs, the questions are more likely to include: How is this new environment similar to others in which I have operated? How is this new organization similar to the established organizations I have managed?
3. Strategic tasks are designed to stimulate entrepreneurs to think about which strategies are appropriate for solving the problem or pursuing the opportunity. Generally, these questions include: What strategy/tactic/principle can I use to solve this problem? Why is this the most appropriate one? How can I organize the information to solve the problem? How can I implement the plan? Specific to entrepreneurs, the questions are likely to include: What changes to strategic position, organizational structure, and culture will help us manage our newness? How can the implementation of this strategy be made feasible?
4. Reflection tasks are designed to stimulate entrepreneurs to think about their understanding and feelings as they progress through the entrepreneurial process. These tasks motivate

entrepreneurs to generate their own feedback to provide the opportunity to change. Generally, reflection questions include: What am I doing? Does it make sense? What difficulties am I facing? How do I feel? How can I verify the solution? Can I use another approach for solving the task? Specific to the entrepreneurial context, entrepreneurs might ask: What difficulties will we have in convincing our stakeholders? Is there a better way to implement our strategy? How will we know success if we see it?

Entrepreneurs who are able to increase cognitive adaptability have an improved ability to (1) adapt to new situations-that is, it provides a basis by which a person's prior experience and knowledge affect learning or problem solving in a new situation; (2) be creative-that is, it can lead to original and adaptive ideas, solutions, or insights; and (3) communicate one's reasoning behind a particular response (Mevarech & Kramarski, 2003).

This chapter provides the theoretical foundation for the research, showing how can entrepreneurs think and act with great flexibility and awareness. It was explained how entrepreneurs make decisions in uncertain environments and what reasoning they can follow, being either Bricolage, Effectuation and Cognitive Adaptability.

## **METHODOLOGY**

The present chapter summarizes how the research was conducted through research design, variables, target population, and instruments that were used for data collection, data analysis and data presentation

### **Research Design**

A research design is a plan that works as a guide through the research process, improving the chances of achieving the research objectives (Wilson, 2014). The present thesis adopted the descriptive research style, since it's going to describe the present phenomena of how former oil workers have started new companies since 2015, by way of individual questionnaire answers from the founders. This study is taking a quantitative approach with a cross-sectional design, using primary and secondary data.

### **Sampling, sample size and data collection**

The study intended to target established companies by former oil & gas workers in Norway since 2015 until the end of 2017.

Brønnøysundregisterene, which is of public domain and contains numerous registers for Norway and governmental systems for digital exchange of information, were used for obtaining e-mails of all the companies established in Norway since 2015. Mournfully, from the 84 910 companies established in 2015, only 14 182 had email addresses registered in Brønnøysundregistrene.

Using the tool of Proff website, it was possible to gather the data from Brønnøysundregistrene, which includes the postal information and industry characterization, contact information of the company such as CEO and chairman of the board of all the companies in Norway.

Sympa, which is a Mailing list management software was used for reaching the 14 182 email addresses. The goal of this survey it was to attain 386 responses for having a confidence level of 95% +/- 5 confidence interval. After a week of being sent, a reminder email was sent, obtaining at the end a total of 420 replies. From these, 126 replies came from companies where the founder had a previous background from the oil & gas industry.

### *The Questionnaire*

The questionnaire was designed using the Likert scale, where the answers for each question have a maximum range of 5 possibilities, because of its popularity and ease to answer (Little & Spector, 2013). This scale was originally designed for attitude assessment and its usefulness for appraising different constructs. The common procedure with this scale is to combine the items that are related to the construct in question, either by summing or averaging. For the present questionnaire it was used a bipolar set of answers while working with the entrepreneurship models (the answer range went from disagreement to agreement, please refer to the appendix A to see the complete Questionnaire).

The tool for preparing the questionnaire was Nettskjema, which it is a tool for designing and managing data collection using forms on the web. It is available at [nettskjema.uio.no](http://nettskjema.uio.no).

The questionnaire was intended to be short, so it could be easily answered. Since the entrepreneurship models have similarities in their alignment, avoiding repetitive questions was desired at a certain degree.

The first Introduction question was important because it was the filter for entering the rest of the questionnaire and knowing if the company had a core member of the team with a O&G

background. The second question it was used for estimating the sales of the new established firm.

### **Variables for the study**

With help of the theory presented in the previous chapter, all the variables came from the sent set of questions.

#### ***First Sale***

The first sale it is a variable used to see when did the study target group started sales. It is the control variable for this study since it has an even distribution during the years regardless the Entrepreneurship model used, as described in the next chapter. For this research, only startups that had sales from 2015 where considered, that reduced the amount of responses but increased but increased the reliability of the obtained answers. This variable corresponds to Question 2 (Q2) of the questionnaire.

#### ***Decision Making Environment***

The Decision-Making Environment (DME) variable was used as independent variable.

Entrepreneurs react different according to the situation, therefore having an overview of the DME will help to understand the circumstances that might decide if they are prone to a certain entrepreneurship model. The most relevant factors for decision making were considered, namely certainty, risk perception, time pressure and emotion repercussion. Each of them represented by a question that was composed by the author, according to the theory chapter of this work.

This variable was calculated by firstly reverse coding Q3 and then adding it to the answers of the respective questions about this variable, Q4, Q5 and Q6. Once done this, the result was ranked



into three categories, for better interpretation: Calm (below 40% in DME), Regular (between 40% and 70%) and Rough (above 70%).

### ***Bricolage***

Bricolage is the first dependent variable. Most research about bricolage defines it as “making do by applying combinations of the resources at hand to new problems and opportunities” (Baker & Nelson, 2005). The oil & gas industry is a mixture of professional fields where multidisciplinary is a key. If it is considered that most emerging and young firms work under resource constraints, it could be conceivable that former oil & gas workers tend to recombine resources for achieving their goals.

The questions for measuring this construct came from the measuring instrument of Davidsson, Baker, and Senyard (2017). This variable was calculated by adding the answer of the questionnaire from Q7 to Q11.

### ***Effectuation***

Effectuation is another dependent variable. This construct is mostly referred in uncertainty situations characterized by following the principles of: Starting with available means, applying the affordable loss concept, establishing and leveraging strategic relationships and leveraging contingencies. In order to have a consistent and validated set of questions for this variable, it was used in a general way the measurement questionnaire of Chandler, Detienne, McKelvie, and Mumford (2011).

### *Cognitive Adaptability*

Cognitive Adaptability (CA) is the last dependent variable, defined as the ability to effectively and appropriately change decision policies (i.e., to learn) given feedback (inputs) from the environmental context in which cognitive processing is embedded (Haynie & Shepherd, 2009). Research suggests that while such a cognitive task is difficult to achieve (Rozin, 1976), it is positively related to decision performance in contexts that can be characterized as complex, dynamic, and inherently uncertain (Earley & Ang, 2003). The entrepreneurial context exemplifies such a decision environment.

This variable was calculated with help of the measuring instrument of Haynie and Shepherd (2009), that included the topics of Goal Orientation, Metacognitive Knowledge, Metacognitive experience, Metacognitive Choice and Monitoring. This instrument uses the concept of Metacognition, which describes a process that incorporates self-regulation, but yet advances regulation to also describe the process through which regulation informs the development and generation of new sense-making structures (heuristics) as a function of a changing environment (Flavell, 1987; Nelson, 1996).

CA was determined by adding the questionnaire answers from Q18 to Q25.

### **Data Analysis**

The tools used for data analysis were Microsoft Excel 2016 and IBM SPSS Statistics 25.

Nettskjema provided the answers plus has a quick analysis view for viewing the responses.

Descriptive statistics using frequency tables, percentages and graphs were used to present the data. The results from the statistical analysis were then used to summarize the findings.

## **Reliability and validity of the study**

In order to use valid and reliable questions for this research, the author used measurement tools that were previously tested, published and used in diverse research studies. The data from Brønnøysundregistrene is official and published by the Norwegian government, thus reliable. The questionnaire was sent to the contact person of the company, which in most of the cases is the CEO and/or Chairman of the Board. Since 14 182 mails were sent, several people contacted the author for clarification regarding the legitimacy of the research, and further inquiries.

The questionnaire was tested with five entrepreneurs before sending it out. Three of them were selected since they have a technical background in the Oil&Gas business and were a perfect match for the research.

Luckily, most of the respondents answered appropriately, meaning that their answers did not fall in the middle of the answering scale. The questionnaire was expected to take about 5 minutes to resolve, following the results of the test run. When the questionnaire was finally sent, 90% of the answers were responded in less than 6 minutes and 31 seconds, having a median of 4 minutes and 33 seconds and only 17 answers took less than 3 minutes to answer, denoting that at least 87% answers are during the expected response time.

## LIMITATIONS

It has to be noted that the sent questionnaire it is a short version of surveys found in academic papers of Chandler et al. (2011), Davidsson et al. (2017) and (Haynie & Shepherd, 2009).

Therefore, the measurements of the different constructs are not as accurate as the ones they proposed since this research intends to measure all three of them plus Decision Making Environment. Even though in the case of Effectuation and Cognitive adaptability, since these are multidimensional concepts, each of the dimensions is properly represent in the used questionnaire for the present work.

Since each entrepreneurship model had abstractions related to each other, some of the questions might be repetitive. For example, concepts such as working with available resources and opportunity recognition are repeated in its particular manner, which is shown in academic articles. The reiteration of questions was avoided as much as possible in the sent survey.

In the present survey it was chosen not to follow strictly the four capabilities of Bricolage (addressing resource scarcity actively, making do with what is available, improvising when recombining resources, and networking with external partners) presented at the instrument of Davidsson et al. (2017), since the instrument had questions that appeared repetitive regarding dealing with challenges and recombination of resources.

The chosen entrepreneurship models were used in the research due to their relevance and popularity in the field. Other models were not included since measurement tools were not found and the author couldn't design reliable and valid questions. Having in mind also that the comparison between more than three models can be less accurate and misleading.

Regarding the questionnaire, when the first round of emails was sent, the author didn't include as mandatory to introduce the respondents' emails. This was an error that caused 52 anonymous answers and thus, not possible to track the postal and industry information from Brønnøysundregistrene. Even though, 74 respondents submitted their email addresses into the questionnaire form.

## RESULTS AND ANALYSIS

Out of the 420 questionnaires received, 126 came from people that were former workers from the O&G industry. Only the answers of these 126 respondents were enabled to continue with the questionnaire, since the answers of the remaining respondents are not in the scope of this research.

Each question had a possible answer ranging from 1 to 5 (see Appendix for questionnaire).

### Industry

In order to explain in which industry these entrepreneurs currently exert themselves, the Standard Industrial Classification (SIC) was used:

<b>Number</b>	<b>SIC Letter - Industry description</b>
1	A - Agriculture, forestry and fishing
2	B - Mining and quarrying
3	C - Manufacturing
4	D - Electricity, gas, steam and air conditioning supply
5	E - Water supply; sewerage, waste management and remediation activities
6	F - Construction
7	G - Wholesale and retail trade; repair of motor vehicles and motorcycles
8	H - Transportation and storage
9	I - Accommodation and food service activities
10	J - Information and communication
11	K - Financial and insurance activities
12	L - Real estate activities
13	M - Professional, scientific and technical activities
14	N - Administrative and support service activities
15	O - Public administration and defence; compulsory social security
16	P - Education
17	Q - Human health and social work activities
18	R - Arts, entertainment and recreation
19	S - Other service activities
20	T - Activities of household as employers; undifferentiated goods- and services-producing
21	U - Activities of extraterritorial organisations and bodies

*Table 1: Standard of Industrial Classification (SIC), Standard for næringsgruppering (NACE)*

By using the respondents email addresses, it was possible to find out in which industry does the respondents presently work, having the resulting distribution:

	Industry	Frequency	Percent	Valid Percent
Valid	1	1	0,8	1,4
	3	5	4	6,8
	5	1	0,8	1,4
	6	5	4	6,8
	7	8	6,3	10,8
	8	1	0,8	1,4
	10	7	5,6	9,5
	11	2	1,6	2,7
	12	4	3,2	5,4
	13	30	23,8	40,5
	14	8	6,3	10,8
	16	1	0,8	1,4
	18	1	0,8	1,4
		<b>Total</b>	74	58,7
Missing	System	52	41,3	
<b>Total</b>		126	100	

*Table 2: Industry distribution of the complete data set*

It is prominent in the table above that most of the respondents work within Professional, scientific and technical activities, such as:

- Legal and accounting activities
- Activities of head offices; management consultancy activities
- Architectural and engineering activities; technical testing and analysis
- Scientific research and development
- Advertising and market research
- Other professional, scientific and technical activities
- Veterinary activities

## Decision Making Environment Results

The maximum possible score for this four-question variable was 20, and the minimum was 4. After having the total score for this variable, it was easier for the author to understanding if it was presented in percentage.

This variable had the following results:

<b>N</b>	126
<b>Mean</b>	47,07%
<b>Median</b>	47,50%
<b>Mode</b>	40%
<b>Minimum</b>	15%
<b>Maximum</b>	95%

*Table 3: Statistical distribution of the Decision-making environment*

	<b>Frequency</b>	<b>Percent</b>
<b>15 %</b>	2	1,6
<b>20 %</b>	6	4,7
<b>25 %</b>	5	3,9
<b>30 %</b>	9	7
<b>35 %</b>	13	10,2
<b>40 %</b>	17	13,3
<b>45 %</b>	12	9,4
<b>50 %</b>	15	11,7
<b>55 %</b>	16	12,5
<b>60 %</b>	15	11,7
<b>65 %</b>	6	4,7
<b>70 %</b>	7	5,5
<b>75 %</b>	4	3,1
<b>95 %</b>	1	0,8
<b>Total</b>	128	100

*Table 4: Frequencies of DME, general distribution*

With this outcome it was possible to divide the DME variable into three categories, having the following return:



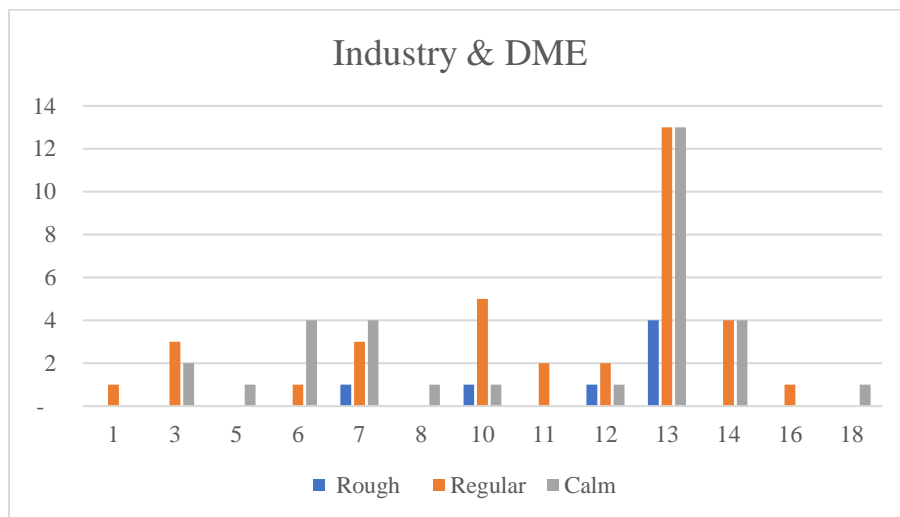
<b>Rough (1)</b>	12	10 %
<b>Regular (2)</b>	64	50 %
<b>Calm (3)</b>	50	40 %
<b>Total</b>	126	100 %

*Table 5: DME categorization frequencies*

It is quite notorious that the DME is not perceived as rough for former O&G workers. This must be interpreted against the previous industry they were working before, since the challenges of working with O&G projects has been stressing the last years before the price crisis and now they face different circumstances.

### Industry & DME

When the Industry distribution of the respondents is broken down using their corresponding DME category, no variation from the main DME distribution was found except for the Construction Industry (number 6), wherein a Calm DME is as predominant as Regular DME, being the same in the Administrative and support service sector.



*Figure 4: Industry distribution including DME*

## Entrepreneurship Model Analysis

Bricolage, Effectuation and Cognitive Adaptability were calculated for every single response to the questionnaire if they had a previous background in the O&G industry. A percentual description of the results is shown in the next table:

	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>Bricolage %</b>	126	36,00	100,00	80,2540	12,58567
<b>Effectuation %</b>	126	30,00	100,00	76,2698	13,11560
<b>CA %</b>	126	37,50	100,00	79,6032	11,90971

*Table 6: Entrepreneurship models' descriptive statistics*

Firstly, it was calculated how the respondents scored in each of the entrepreneurship models and presented as percentage. Then, only the highest score was considered as the best match for that specific response. The results from this analysis follows:

	<b># of Companies</b>	
<b>Bricolage</b>	57	42 %
<b>Effectuation</b>	21	15 %
<b>Cognitive Ad</b>	59	43 %

*Table 7: Entrepreneurship models' frequencies*

The table above demonstrates the general distribution of the entrepreneurship models for all the respondents that fall into the study's target group. It has the approximate proportion of Bricolage : Effectuation : Cognitive Adaptability of 3:1:3, that is repetitive in the rest of the study.

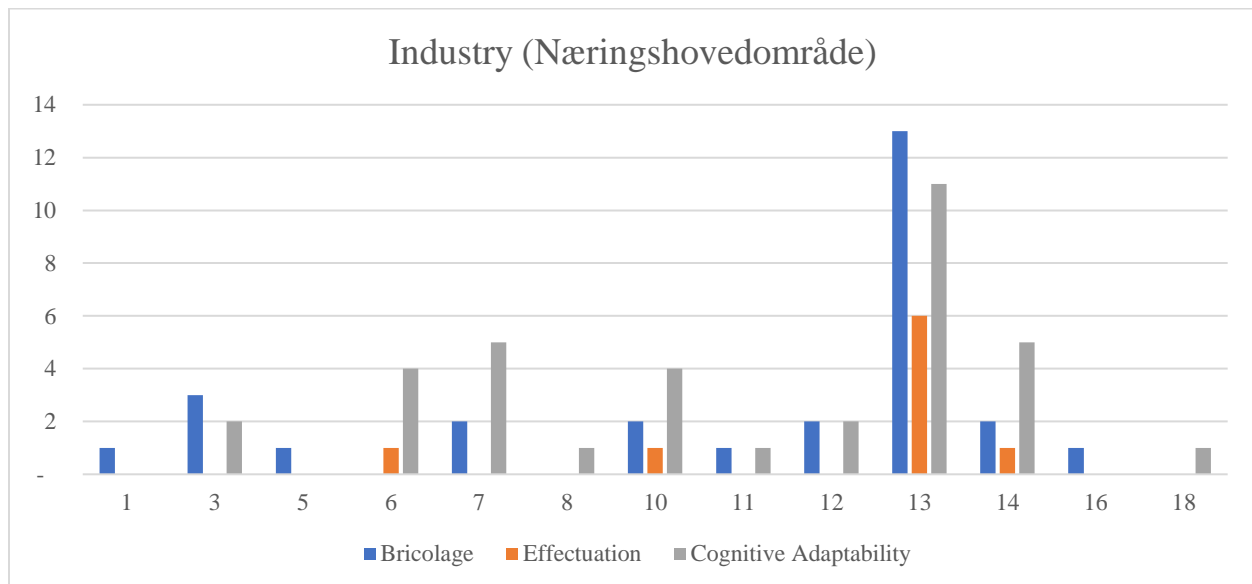
It must be noted that few companies had the same score in two entrepreneurship models, therefore they were counted in both models, the coming table displays this amount of repetitions:

<b>Bricolage &amp; Effectuation</b>	2 companies
<b>Bricolage &amp; Cognitive Adaptability</b>	2 companies
<b>Effectuation &amp; Cognitive Adaptability</b>	1 company
<b>Bricolage, Effectuation &amp; Cognitive Adaptability</b>	2 companies

*Table 8: Repetitive cases in Entrepreneurship models*

## Industry & Entrepreneurship Models

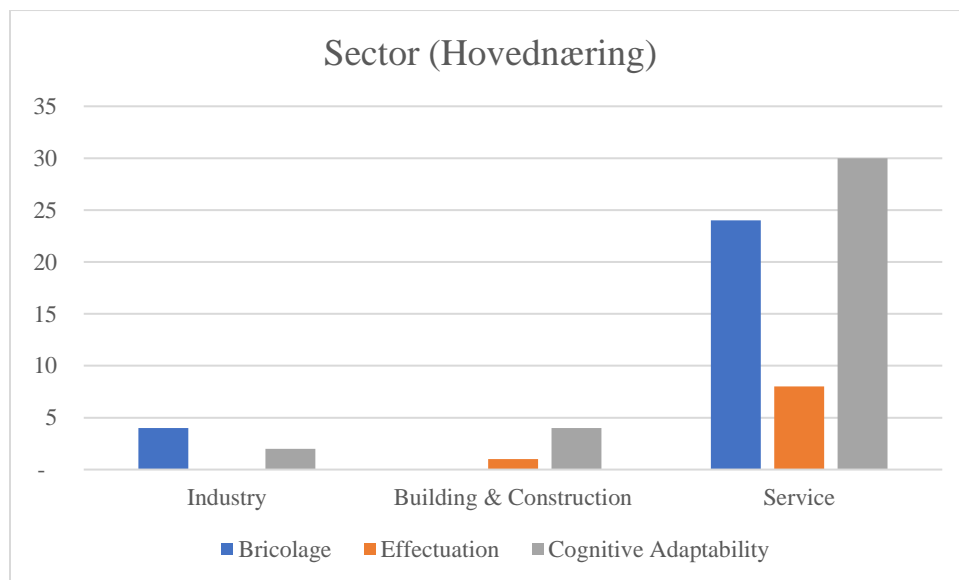
It shows a predominance in the area of professional, scientific and technical activities (number 13) with 50 companies out of 76, as seen on the graph. This group also has the highest proportion of Effectuators, that follow the principles of affordable loss, with strategic relationships and leveraging contingencies. In Construction (number 6), it is seen that Bricolage is not present, which indicates that this occupation does not require recombination of resources, therefore there might not be a lack of means. The rest of the industries have a distribution equivalent to the general distribution of all three of the entrepreneurship models.



*Figure 5: Industry distribution including Entrepreneurship models*

## Sector & Entrepreneurship Models

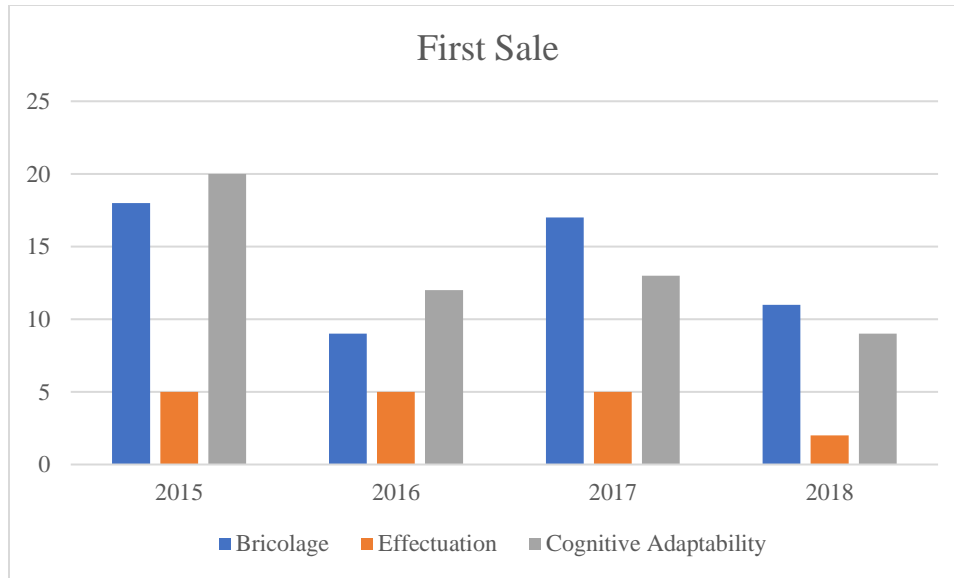
Looking at different the types of businesses in the way of Sector is a coarser manner of categorizing. The Service sector has a clear dominance amongst former O&G workers, with small presence in the Industry sector and Building & Construction. It is also seen that the Entrepreneurship models' distribution follows the general distribution for the whole target population.



*Figure 6: Sector distribution including Entrepreneurship models*

## First Sale & Entrepreneurship Models

It must be noted that the distribution of the company's first sale is similar to the general distribution of the entrepreneurship models in the target group. In addition, this variable has a certain consistency during the years. Hence it was used as a control variable. It has to be considered that the present work has been written during May of 2018, so the information shown in that year is not complete.



*Figure 7: Companies first sale distribution including Entrepreneurship models*

## Competence Intensity

Competence Intensity (CI) is a concept that defines the amount of personnel that has higher education (HE) in an industry, defined at the four-digit SIC-code (NACE-code) level. The following table defines the categories of CI:

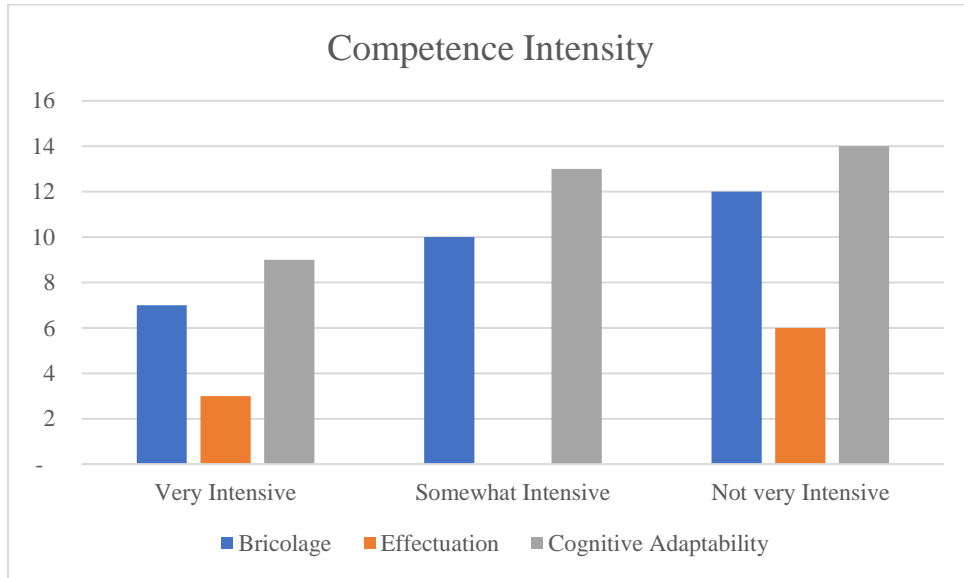
Categories	Selection Criteria of 4-digit-SIC-industries/services
1. Competence Intensive industries/services	> 39,4 % HE instructed personnel
2. Somewhat Competent Intensive industries/services	39,2 – 17,0 % HE instructed personnel
3. Not very Competent Intensive industries/services	< 17,0 % HE instructed personnel

Source: Onsager, Knut et al (2010): Kompetanseintensive næringer og tjenester – lokalisering og regional utvikling. NIBR-rapport 2010:20, Oslo, pag. 47

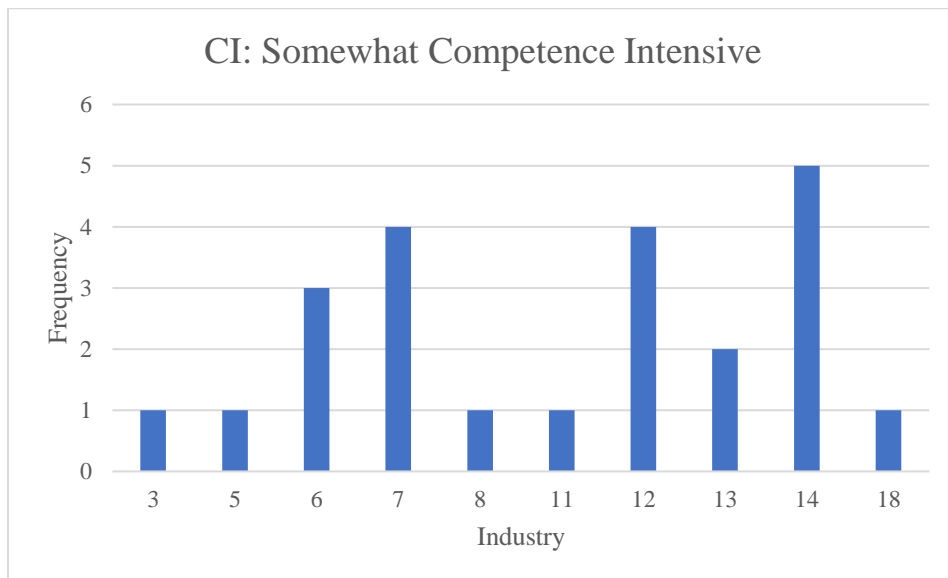
*Table 9: Competence Intensity category explanation*

When Competence Intensity (CI) is being considered, it is displayed in the graph below that Effectuation is not present for the “Somewhat intensive” category, and it increases its

representation in the other two CI categories. Even though, Bricolage and Cognitive Adaptability have a dispersion similar to the general distribution.



**Figure 8:** *Competence Intensity distribution including Entrepreneurship models*

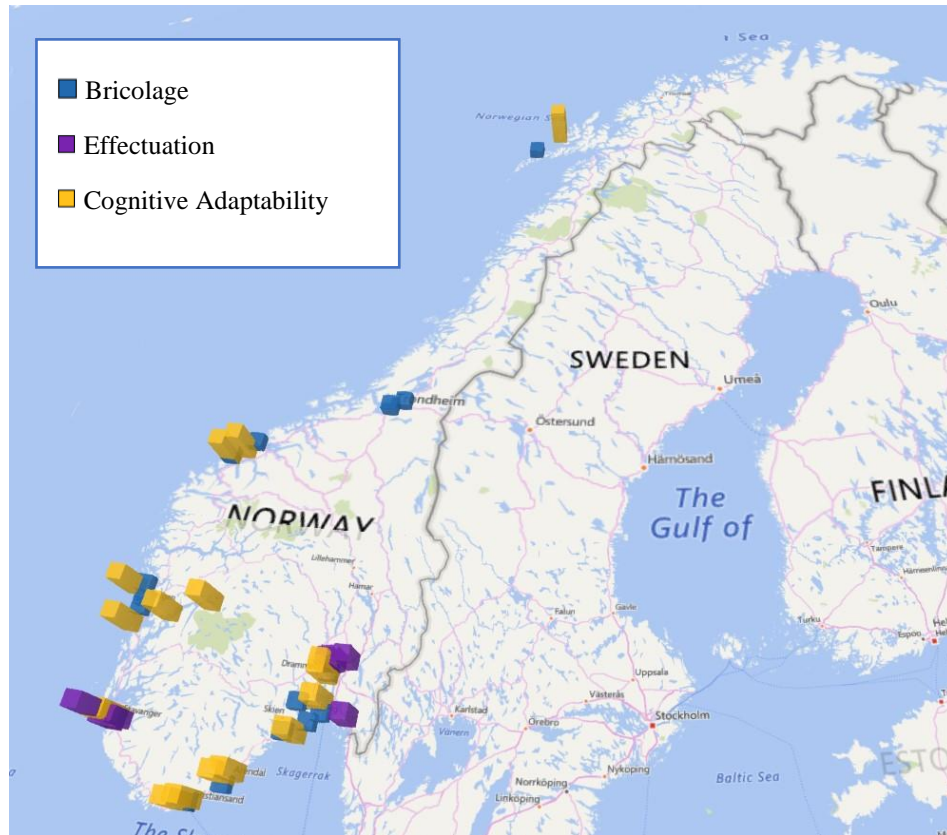


**Figure 9:** *Somewhat Competence Intensive distribution regarding Industry*

In this plot, where only the category of somewhat Competence Intensity is considered, the Professional, scientific and technical industry (number 13) does not have a similar distribution as in the overall industry graph. Instead, Administrative and support (number 14), Real estate (number 12) and Wholesale and retail trade, repair of motor vehicles and motorcycles (number 7) have more representation. Therefore, the absence of effectuation indicates a different industry distribution that does not follow the general dispersion. Also marking that in the Professional, scientific and technical field (number 13) is an environment where effectuation can occur with more ease.

### **Centrality**

This concept refers to the geographical location of a municipality in relation to a center where there are functions of high order (key functions such as mail, bank). The central functions are primarily located in villages. The villages are divided into three levels by population numbers and offers of functions. Villages on level 3 are rural centers (or population numbers of at least 50,000), level 2 has a population of between 15,000 and 50,000 and level 1 has a population of between 5,000 and 15,000. There are four main levels of centrality, code 3-0, depending on the travel time of the different urban areas. One has also noted whether municipalities at the central level 0-2 are such that it is possible to carry out flat-rate day trips to a 3-seater village. A change in the 2008 standard is that Central Level 3 is divided into three sub-levels. Please refer to the map below displaying all the companies and their best matched entrepreneurship model.



**Figure 10:** Geographical Entrepreneurship models' distribution

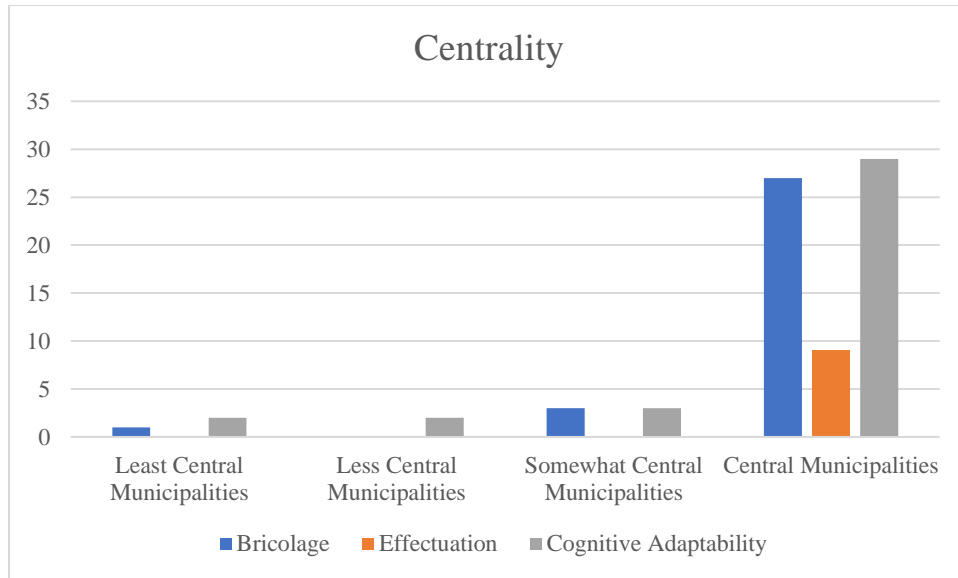
The table below shows that most of the companies are located in a central area in the country.

The following plot shows that the entrepreneurship model distribution follows approximately the general distribution of 3:1:3 in every category of centrality.

Centrality	# of Companies
Least Central Municipalities	3
Less Central Municipalities	2
Somewhat Central Municipalities	6
Central Municipalities	65

**Table 10:** Centrality frequencies of the study group





*Figure 11: Centrality distribution including Entrepreneurship models*

## DME Effect in The Entrepreneurship Models

### *DME in Bricolage*

When DME is considered in the companies that have Bricolage as their most representative Entrepreneurship model, this distribution doesn't change significantly, as seen in the table below:

<b>DME Category</b>	<b>Bricoleur Companies</b>	<b>In Bricolage</b>	<b>DME General Distribution</b>
<b>Rough</b>	7	13 %	10 %
<b>Regular</b>	30	55 %	50 %
<b>Calm</b>	18	33 %	40 %
<b>Total</b>	55	100 %	100 %

*Table 11: DME distribution in Bricoleur companies*

### *DME in Effectuation*

Here it can be seen that there is a slight tendency towards a "Regular" DME, but still it reflects the general distribution

<b>DME Category</b>	<b>Effectuator Companies</b>	<b>In Effectuation</b>	<b>DME General Distribution</b>
<b>Rough</b>	3	14 %	10 %
<b>Regular</b>	13	62 %	50 %
<b>Calm</b>	5	24 %	40 %
<b>Total</b>	21	100 %	100 %

*Table 12: DME distribution in Effectuator companies*

### ***DME in Cognitive Adaptability***

Even though Cognitive Adaptability is positively related to decision performance in contexts that can be characterized as complex, dynamic, and inherently uncertain (Earley & Ang, 2003), most of the cognitive adaptable population does not have a rough DME, which means that risk, time pressure and emotions are not in the table.

<b>DME Category</b>	<b>Cognitive Adaptable Companies</b>	<b>In Cognitive Adaptability</b>	<b>DME General Distribution</b>
<b>Rough</b>	4	7 %	10 %
<b>Regular</b>	26	44 %	50 %
<b>Calm</b>	29	49 %	40 %
<b>Total</b>	59	100 %	100 %

*Table 13: DME distribution in Cognitive adaptable companies*

Between the calm DME population with CA as Entrepreneurship model, it was noticed that the common trend is to work as a consultant and retail trade. The regular and rough populations don't have such a strong representative trend.

### **Correlation Analysis**

The table below displays the correlations between variables with each other and indicates values for Pearson correlations, Sig. (2-tailed) and number of samples (N) in each variable. The results show that Decision Making Environment is negatively related to Bricolage (-0,050), positively

related to Effectuation (0,064) and negatively and significantly related to Cognitive Adaptability (-0,238). As in the case of Bricolage, the main characteristic is the lack of resources and optimizing the process of creating something from nothing with the resources at hand, where a change in the DME does not affect this approach. On the same side, Effectuation demands to the decision makers to deal with unpredictability for gathering information through experimental and interactive learning, where DME does not play a significant role, which explains why the arbitrary distribution of Effectuation in the different industries. Cognitive Adaptability is different from these two constructs, since it is about being flexible, dynamic in multiple decision framework, where DME is more representative and can affect the metacognition processes that characterizes this model.

Bricolage has a positive and strong relationship with Effectuation (0,656) and Cognitive Adaptability (0,545). This means that Bricoleurs apply Effectuation and Cognitive Adaptability in their work. For Effectuation, working with own means and leveraging contingencies are effectuation principles analogous to Bricolage. It is interesting that bricoleurs use Cognitive Adaptability, which indicates metacognitive awareness it is used in Bricolage.

Effectuation is positively and significantly related to Cognitive Adaptability, that establishes a connection between these two constructs in a similar way that Bricolage is related to Cognitive Adaptability.

As a result, the people in the study group engage themselves in one or several of the entrepreneurship models, where they adapt themselves according not only to the DME they have but other factors such as the tasks they do.

		Decision_Making _Environment	Bricolage	Effectuation	Cognitive_Adap tability
<b>Decision_Makin g_Environment</b>	<b>Pearson Correlation</b>	1	-,050	,064	-,238**
	<b>Sig. (2-tailed)</b>		,580	,479	,007
	<b>N</b>	126	126	126	126
<b>Bricolage</b>	<b>Pearson Correlation</b>	-,050	1	,656**	,545**
	<b>Sig. (2-tailed)</b>	,580		,000	,000
	<b>N</b>	126	126	126	126
<b>Effectuation</b>	<b>Pearson Correlation</b>	,064	,656**	1	,582**
	<b>Sig. (2-tailed)</b>	,479	,000		,000
	<b>N</b>	126	126	126	126
<b>Cognitive_Adapt ability</b>	<b>Pearson Correlation</b>	-,238**	,545**	,582**	1
	<b>Sig. (2-tailed)</b>	,007	,000	,000	
	<b>N</b>	126	126	126	126

\*\* . Correlation is significant at the 0.01 level (2-tailed).

*Table 14: Correlation analysis amongst Entrepreneurship models*

### **Firs Sale & Establishment Year**

The company's first sale has a relative constant behavior with an average of 21 company having their first sale since beginning of 2015 to the end of 2017, and standard deviation of 5,568. In the case of the establishment year it also has a relative consistent behavior, being the average 24 companies per year with a standard deviation of 3,606.



*Figure 12: Companies first sale including Establishment year*

If these two variables are correlated they have a significant relationship of 0,543, that demonstrates the reason of an even distribution of the companies' first sale.

	<b>First Sale</b>	<b>Establishment year</b>
<b>Pearson Correlation</b>	1	,543**
<b>N</b>	76	76

*Table 15: Correlation between companies' first sale and establishment year*

### **Regression Analysis**

The intention of this work is to demonstrate that DME has an influence in the Entrepreneurship models, having as a control variable the company's first sale, that has a constant behavior during the 2015 to 2017 interval.

#### ***Bricolage dependency in DME***

Here the dependent variable is Bricolage. The summary below illustrates that  $R = 0,070$ , which is the correlation of observed and predicted values of the current dependent variable. R square in the summary is 0,005, and represents the overall proportions of variance in Bricolage, involving independent and control variable as factors that may explain this entrepreneurship model. This result shows no relevant significance. Therefore, Bricolage is not a function of DME.

<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
,070 <sup>a</sup>	,005	-,011	3,16401

*Table 16: Regression of DME vs Bricolage*

### ***Effectuation dependency in DME***

The same procedure was done for Effectuation for determining the effect of the control variable. In this case the results indicate that  $R = 0,094$  and that R square is 0,009. As the previous instance, shows that Effectuation is not a function of DME.

<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
,094 <sup>a</sup>	,009	-,007	3,94891

*Table 17: Regression of DME vs Effectuation*

### ***Cognitive Adaptability dependency in DME***

This regression below shows that the dependency of Adaptive Cognition is 0,251, having a R square of 0,063 which is significant for defining a relationship. DME has a relevant influence in Adaptive Cognition in the way for engaging in the different metacognitive dimensions of this construct. Also, Cognitive Adaptability does not enclose conceptions of resources and/or interaction with strategic partnerships, which is characteristic of Bricolage and Effectuation. Hence, a rougher DME needs higher order cognitive processes to succeed in an endeavor for the chosen study group.

<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
,251 <sup>a</sup>	,063	,048	4,64864

*Table 18: Regression of DME vs Cognitive Adaptability*

## CONCLUSIONS

The present study's main purpose was to find out which Entrepreneurship model is employed most by former Oil & Gas workers after the oil price crisis of 2014. The chosen models to adopt were Bricolage, Effectuation and Cognitive Adaptability. Amongst these models, Bricolage and Cognitive Adaptability were the most used by the study segment, by having 42% and 43% respectively of representation from the complete survey responses. In the case of Effectuation, it illustrated 15% of the replies.

The correlation analysis between the Entrepreneurship models indicated strong relationships, since the intention of these are to measure mental processes to decide whether a business opportunity exists or processing feedback from the steps taken in that venture.

The consequent purpose of the research was to determine the effect of the Decision-Making Environment (DME) in the Entrepreneurship models, since entrepreneurs work in remarkably uncertain and strained contexts, which affects rational processes. The general distribution of DME was classified into three categories with the respective percentages: Rough (10%), Regular (50%) and Calm (40%). The company's first sale distribution throughout 2015 to 2017 was used as control variable, since it is rather constant because it follows the company's establishment year dispersion, which is also relatively constant. The research's results display that DME does not have an impact in Bricolage and Effectuation.

On the other hand, Cognitive Adaptability shows a relationship with DME, with a regression of 0,251. This is because Adaptive Cognition is a construct defining ways of thinking (and consequently behaving), thus a change in the feeling of uncertainty, time pressure, risk and emotions can influence Adaptive Cognition's way of reasoning.

It was possible to determine in which industry does the oil workers started their ventures, being predominant the area of professional, scientific and technical activities with 50 companies out of 76. Here the amount of effectuators was more represented than in the other industries.

Competence Intensity, which is a measure of the amount of personnel that has higher education, was calculated and it showed the lack of presence of effectuators in the category of "somewhat competence intensive". When this category was broken down into industries, it was noticed that the professional, scientific & technical class, where had most of effectuators, had a minor presence. Administrative, Real Estate and Wholesale classes were more represented in the "Somewhat Competence Intensive" category.

Geographical Centrality of the company's location, in reference to services of high order such as mail and bank, was calculated. It disclosed that most of the companies are located in central municipalities, and that the distribution amongst bricoleurs, effectuators and cognitive adaptable entrepreneurs follows the Entrepreneurship model's general distribution of 3:1:3.

### **Future research**

The found relation between Cognitive Adaptability and DME it is something interesting to determine. Having a single questionnaire dedicated to both topics can help to measure its effects and confirm the relationship.

Extending the present study with interviews to have a qualitative approach would be beneficial. With that extension, it will be possible to determine in detail how do former oil & gas workers perceive their decision-making environment and confirm further details about the entrepreneurship model that might be suitable for them.



This type of studies would be beneficial since it can show ways of promoting entrepreneurship across the country focusing in an important industrial sector. Plus, replicas of this type of studies can be perform for other industries.

## **Recommendations**

Since Bricolage is one of the most used entrepreneurship models found in this study, it is recommended for this group of entrepreneurs to be aware that recombining resources to achieve goals is very useful at the early phases, such as prototyping, but the extensive use of bricolage does not generate growth according to literature. Something that the startup community should be aware.

Finding that Cognitive Adaptability is the other most used entrepreneurship model, points out that former oil workers have a higher-order cognitive processing, so they can work in complex and dynamic environments. Entrepreneurship should be promoted strongly to the employed personnel in the oil & gas industry since they have this capability, in the way of having an option for workers to chase business opportunities. A plan could be implemented so they can combine work and their startup so they don't have to risk their fixed job. The government should regulate and have a program where the most promising projects can have some time away from work to develop the business idea at the own entrepreneur's risk.

## REFERENCES

- B. I. Handleshøyskolen; Det er ikke sånn at gode produkter selger seg selv; <https://www.bi.no/studere-ved-bi/kampanjesider/alt-er-okonomi/det-er-ikke-sann-at-gode-produkter-selger-seg-selv/>; 20/03/2018, 2018.
- Baker, T. & Nelson, R. E. 2005. Creating Something from Nothing: Resource Construction through Entrepreneurial Bricolage. *Administrative Science Quarterly*, 50(3): 329-366.
- Birley, S., MacMillan, I. C., & European Foundation for Entrepreneurship, R. 1992. *International perspectives on entrepreneurship research : proceedings of the First Annual Global Conference on Entrepreneurship Research, London, UK, 18-20 February 1991*. Amsterdam: North-Hollan.
- Brannon, D. L., Wiklund, J., & Haynie, J. M. 2013. The Varying Effects of Family Relationships in Entrepreneurial Teams. *Entrepreneurship Theory and Practice*, 37(1): 107-132.
- Brozik, D. & Zapalska, A. 2006. Entrepreneurial Decision Making in a Dynamic Environment: The Entrepreneurship Game. *Journal of East-West Business*, 12(2-3): 131-169.
- Chandler, G. N., Detienne, D. R., McKelvie, A., & Mumford, T. V. 2011. Causation and effectuation processes: A validation study. *Journal of Business Venturing*, 26(3): 375-390.
- Coviello, N. E. & Cox, M. P. 2006. The resource dynamics of international new venture networks. *Journal of International Entrepreneurship*, 4(2-3): 113-132.
- Covin, J. G. & Slevin, D. P. 1991. A conceptual model of entrepreneurship as firm behavior. *Entrepreneurship theory and practice*, 16(1): 7-26.
- Dagens Næringsliv; Solbergs nyttårstale: – Nordmenn må forberede seg på en ny fremtid - DN.no; <https://www.dn.no/nyheter/2018/01/01/1951/Politikk/solbergs-nyttarstale-nordmenn-ma-forberede-seg-pa-en-ny-fremtid>; 19/03/2018, 2018.
- Davidsson, P., Baker, T., & Senyard, J. M. 2017. A measure of entrepreneurial bricolage behavior. *International Journal of Entrepreneurial Behavior & Research*, 23(1): 114-135.
- DeGraff, J. & Nathan-Roberts, D. 2011. *Innovativeness As Positive Deviance*: Oxford University Press.
- Duymedjian, R. & Rüling, C.-C. 2010. Towards a Foundation of Bricolage in Organization and Management Theory. *Organization Studies*, 31(2): 133-151.
- Earley, P. C. & Ang, S. 2003. *Cultural intelligence: Individual interactions across cultures*: Stanford University Press.
- Fisher, G. 2012. Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research. *Entrepreneurship Theory and Practice*, 36(5): 1019-1051.
- Flavell, J. H. 1987. Speculations about the nature and development of metacognition. *Metacognition, motivation, and understanding*: 21-29.
- Garud, R. & Karnøe, P. 2003. Bricolage versus breakthrough: distributed and embedded agency in technology entrepreneurship. *Research Policy*, 32(2): 277-300.
- Guterman, E. 2002. Toward dynamic assessment of reading: applying metacognitive awareness guidance to reading assessment tasks. *Journal of Research in Reading*, 25(3): 283-298.
- Haynie, M. & Shepherd, D. A. 2009. A Measure of Adaptive Cognition for Entrepreneurship Research. *Entrepreneurship Theory and Practice*, 33(3): 695-714.

- Hisrich, R. D., Peters, M. P., & Shepherd, D. A. 2017. *Entrepreneurship* (Tenth edition. ed.): McGraw-Hill Education.
- Jonckheere, C. d. 2017. Bricolage.
- Kull, T. J., Oke, A., & Dooley, K. J. 2014. Supplier Selection Behavior Under Uncertainty: Contextual and Cognitive Effects on Risk Perception and Choice. *Decision Sciences*, 45(3): 467-505.
- Lado, A. A. & Vozikis, G. S. 1997. Transfer of technology to promote entrepreneurship in developing countries: An integration and proposed framework. *Entrepreneurship Theory and Practice*, 21(2): 55-72.
- Lee, S. M. & Peterson, S. J. 2000. Culture, entrepreneurial orientation, and global competitiveness. *Journal of World Business*, 35(4): 401-416.
- Lévi-Strauss, C. 1966. *The savage mind*, Chicago (The University of Chicago Press) 1966.
- Lindberg, E., Bohman, H., Hulsten, P., & Wilson, T. 2017. Enhancing Students' Entrepreneurial Mindset: A Swedish Experience. *Education & Training*, 59: 768-768), p.768-779.
- Little, T. D. & Spector, P. E. 2013. *Survey Design and Measure Development*.
- Marugán, A. P. & Márquez, F. P. G. 2015. *Decision making approach for optimal business investments*.
- McMullen, J. S. & Shepherd, D. A. 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management review*, 31(1): 132-152.
- Mevarech, Z. & Kramarski, B. 2003. The effects of metacognitive training versus worked-out examples on students' mathematical reasoning. *Br. J. Educ. Psychol.*, 73: 449-471.
- Miettinen, R. & Virkkunen, J. 2005. Epistemic Objects, Artefacts and Organizational Change. *Organization*, 12(3): 437-456.
- Morris, M. H. 1998. *Entrepreneurial intensity: Sustainable advantages for individuals, organizations, and societies*: Greenwood Publishing Group.
- Nelson, T. O. 1996. Consciousness and metacognition. *American psychologist*, 51(2): 102.
- NRK; Oljebransjen; <https://www.nrk.no/nyheter/oljebransjen-1.11527404>; 18/12/2017, 2017.
- Patel, S. & Mehta, K. 2017. Systems, Design, and Entrepreneurial Thinking: Comparative Frameworks. *Systemic Practice and Action Research*, 30(5): 515-533.
- Perry, J. T., Chandler, G. N., & Markova, G. 2012. Entrepreneurial Effectuation: A Review and Suggestions for Future Research. *Entrepreneurship Theory and Practice*, 36(4): 837-861.
- Pliego Marugán, A., García Márquez, F. P., & Lev, B. 2017. Optimal decision-making via binary decision diagrams for investments under a risky environment. *International Journal of Production Research*, 55(18): 5271-5286.
- Rezaei, J. 2015. Best-worst multi-criteria decision-making method. *Omega*, 53: 49-57.
- Rosenzweig, S., Grinstein, A., & Ofek, E. 2016. Social network utilization and the impact of academic research in marketing. *International Journal of Research in Marketing*, 33(4): 818-839.
- Rozin, P. 1976. The evolution of intelligence and access to the cognitive unconscious. *Progress in psychobiology and physiological psychology*, 6: 245-280.
- Sarasvathy, S. 2013. *Encyclopedia of Management Theory*. Thousand Oaks: SAGE Publications, Ltd.
- Sarasvathy, S. D. 2001. Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of management Review*, 26(2): 243-263.

- Schraw, G. & Dennison, R. S. 1994. Assessing Metacognitive Awareness. *Contemporary Educational Psychology*, 19(4): 460-475.
- Senyard, J. M., Baker, T., & Davidsson, P. 2009. Entrepreneurial bricolage: Towards systematic empirical testing.
- Senyard, J. M. 2015. Bricolage and early stage firm performance.
- Shane, S. & Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *Academy of management review*, 25(1): 217-226.
- Suddaby, R., Bruton, G. D., & Si, S. X. 2015. Entrepreneurship through a qualitative lens: Insights on the construction and/or discovery of entrepreneurial opportunity. *Journal of Business Venturing*, 30(1): 1-10.
- Talluri, S., Decampos, H. A., & Hult, G. T. M. 2013. Supplier Rationalization: A Sourcing Decision Model. *Decision Sciences*, 44(1): 57-86.
- Taticchi, P., Garengo, P., Nudurupati, S. S., Tonelli, F., & Pasqualino, R. 2014. A review of decision-support tools and performance measurement and sustainable supply chain management. *International Journal of Production Research*: 1-22.
- Upstream; Saetre concern as players lose appetite for Norway; Upstream  
<http://www.upstreamonline.com/hardcopy/1396676/saetre-concern-as-players-lose-appetite-for-norway>.
- Venkataraman, S. 1997. The distinctive domain of entrepreneurship research. *Advances in entrepreneurship, firm emergence and growth*, 3(1): 119-138.
- Watson, T. J. 2013. Entrepreneurship in action: bringing together the individual, organizational and institutional dimensions of entrepreneurial action. *Entrepreneurship & Regional Development*, 25(5-6): 404-422.
- Weick, K. E. 1993. Organizational redesign as improvisation. *Organizational change and redesign: Ideas and insights for improving performance*, 346: 379.
- Weinert, F. E. & Kluwe, R. H. 1987. *Metacognition, motivation and understanding*. Hillsdale, N.J: Lawrence Erlbaum.
- Wilson, J. 2014. *Essentials of business research: A guide to doing your research project*: Sage.
- Witell, L., Gebauer, H., Jaakkola, E., Hammedi, W., Patricio, L., & Perks, H. 2017. A bricolage perspective on service innovation. *Journal of Business Research*, 79: 290-298.

## APPENDIX A: ENTREPRENEURIAL THINKING QUESTIONNAIRE WITH FREQUENCY TABLES

### Introduction

This questionnaire is for determining the entrepreneurial thinking approach of former oil&gas workers in Norway. The results will be analyzed and presented at the University of Oslo.

1. Was one of the company founders a former worker from the oil & gas industry?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	291	69,8	69,8	69,8
	Yes	126	30,2	30,2	100,0
	Total	417	100,0	100,0	

2. In which year did the first sale happen?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2015	157	37,6	37,6	37,6
	2016	93	22,3	22,3	60,0
	2017	106	25,4	25,4	85,4
	2018	61	14,6	14,6	100,0
	Total	417	100,0	100,0	

### Decision making environment

Please answer the following questions in a scale of 1 to 5.

3. How certain is the company while making strategic decisions?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	2,4	9,0	9,0
	3	34	8,2	30,6	39,6
	4	67	16,1	60,4	100,0
	Total	111	26,6	100,0	
Missing	System	306	73,4		
Total		417	100,0		

4. How often does your company make risky decisions?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		291	69,8	69,8	69,8
	(Once a year) 1	26	6,2	6,2	76,0
	2 (Once every quarter)	32	7,7	7,7	83,7
	3 (Monthly)	40	9,6	9,6	93,3
	4 (Weekly)	22	5,3	5,3	98,6
	5 (Daily basis)	6	1,4	1,4	100,0
	Total	417	100,0	100,0	

5. How often is time pressure affecting the company's decisions in a strong manner?

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Not so often) 1	20	4,8	4,8	74,6
2	26	6,2	6,2	80,8
3	30	7,2	7,2	88,0
4	29	7,0	7,0	95,0
5 (Very often)	21	5,0	5,0	100,0
Total	417	100,0	100,0	

6. How often do emotions affect taking important company decisions?

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Not so often) 1	36	8,6	8,6	78,4
2	33	7,9	7,9	86,3
3	33	7,9	7,9	94,2
4	16	3,8	3,8	98,1
5 (Very often)	8	1,9	1,9	100,0
Total	417	100,0	100,0	

### **Bricolage**

How much do you agree with the following statements?

7. We are confident of our ability to find workable solutions to new challenges by using our existing resources

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	1	,2	,2	70,0
2	6	1,4	1,4	71,5
3	25	6,0	6,0	77,5
4	62	14,9	14,9	92,3
5 (Completely agree)	32	7,7	7,7	100,0
Total	417	100,0	100,0	

8. We use any existing resource that seem useful to respond to a new problem or opportunity.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
2	3	,7	,7	70,5
3	19	4,6	4,6	75,1
4	59	14,1	14,1	89,2
5 (Completely agree)	45	10,8	10,8	100,0
Total	417	100,0	100,0	

9. When dealing with new problems or opportunities we take action by assuming that we will find a workable solution

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	3	,7	,7	70,5
2	5	1,2	1,2	71,7
3	7	1,7	1,7	73,4
4	56	13,4	13,4	86,8
5 (Completely agree)	55	13,2	13,2	100,0
Total	417	100,0	100,0	

10. By combining our existing resources, we take on a surprising variety of new challenges

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
2	11	2,6	2,6	72,4
3	31	7,4	7,4	79,9
4	46	11,0	11,0	90,9
5 (Completely agree)	38	9,1	9,1	100,0
Total	417	100,0	100,0	

11. We combine resources to accomplish new challenges that the resources weren't originally intended to achieve.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
2	13	3,1	3,1	72,9
3	25	6,0	6,0	78,9
4	55	13,2	13,2	92,1
5 (Completely agree)	33	7,9	7,9	100,0
Total	417	100,0	100,0	

## **Effectuation**

12. We adapted what we were doing to the resources we had.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
2	12	2,9	2,9	72,7
3	23	5,5	5,5	78,2
4	57	13,7	13,7	91,8
5 (Completely agree)	34	8,2	8,2	100,0
Total	417	100,0	100,0	

13. We experimented with different products and/or business models.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	9	2,2	2,2	71,9
2	19	4,6	4,6	76,5
3	22	5,3	5,3	81,8
4	48	11,5	11,5	93,3
5 (Completely agree)	28	6,7	6,7	100,0
Total	417	100,0	100,0	

14. We tried a number of different approaches until we found a business model that worked.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	13	3,1	3,1	72,9
2	26	6,2	6,2	79,1
3	28	6,7	6,7	85,9
4	39	9,4	9,4	95,2
5 (Completely agree)	20	4,8	4,8	100,0
Total	417	100,0	100,0	

15. We were flexible and took advantage of opportunities as they arose.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	2	,5	,5	70,3
2	3	,7	,7	71,0
3	9	2,2	2,2	73,1
4	54	12,9	12,9	86,1
5 (Completely agree)	58	13,9	13,9	100,0
Total	417	100,0	100,0	

16. By working closely with people/organizations external to our organization we have been able to greatly expand our capabilities.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	6	1,4	1,4	71,2
2	14	3,4	3,4	74,6
3	21	5,0	5,0	79,6
4	42	10,1	10,1	89,7
5 (Completely agree)	43	10,3	10,3	100,0
Total	417	100,0	100,0	



17. We are confident that our skills and work can overcome situation with tough odds.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	1	,2	,2	70,0
2	7	1,7	1,7	71,7
3	14	3,4	3,4	75,1
4	56	13,4	13,4	88,5
5 (Completely agree)	48	11,5	11,5	100,0
Total	417	100,0	100,0	

## Cognitive Adaptability

18. We allowed the business to evolve as opportunities emerged.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	1	,2	,2	70,0
2	3	,7	,7	70,7
3	16	3,8	3,8	74,6
4	61	14,6	14,6	89,2
5 (Completely agree)	45	10,8	10,8	100,0
Total	417	100,0	100,0	

19. We think about what we really need to accomplish before we begin a task.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	1	,2	,2	70,0
2	9	2,2	2,2	72,2
3	25	6,0	6,0	78,2
4	57	13,7	13,7	91,8
5 (Completely agree)	34	8,2	8,2	100,0
Total	417	100,0	100,0	

20. We focus on the meaning and significance of the information, when making decisions.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	2	,5	,5	70,3
2	5	1,2	1,2	71,5
3	23	5,5	5,5	77,0
4	64	15,3	15,3	92,3
5 (Completely agree)	32	7,7	7,7	100,0
Total	417	100,0	100,0	

21. We use different strategies depending on the situation

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	1	,2	,2	70,0
2	10	2,4	2,4	72,4
3	15	3,6	3,6	76,0
4	46	11,0	11,0	87,1
5 (Completely agree)	54	12,9	12,9	100,0
Total	417	100,0	100,0	

22. We know what kind of information is most important to consider when faced with a problem.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	2	,5	,5	70,3
2	6	1,4	1,4	71,7
3	29	7,0	7,0	78,7
4	58	13,9	13,9	92,6
5 (Completely agree)	31	7,4	7,4	100,0
Total	417	100,0	100,0	

23. We ask ourselves if we have considered all the options when and/or after solving a problem.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	2	,5	,5	70,3
2	8	1,9	1,9	72,2
3	26	6,2	6,2	78,4
4	62	14,9	14,9	93,3
5 (Completely agree)	28	6,7	6,7	100,0
Total	417	100,0	100,0	

24. We reevaluate our assumptions when we get confused.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	3	,7	,7	70,5
2	3	,7	,7	71,2
3	19	4,6	4,6	75,8
4	64	15,3	15,3	91,1
5 (Completely agree)	37	8,9	8,9	100,0
Total	417	100,0	100,0	

25. We ask ourselves if there was an easier way to do things after we finish a task.

	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Valid	291	69,8	69,8	69,8
(Completely disagree) 1	3	,7	,7	70,5
2	7	1,7	1,7	72,2
3	22	5,3	5,3	77,5
4	53	12,7	12,7	90,2
5 (Completely agree)	41	9,8	9,8	100,0
Total	417	100,0	100,0	