Building innovation

Corporate Entrepreneurship in the building industry

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Colophon

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Where innovation starts

Preface

My graduation thesis started about two years ago. I followed an additional course from the faculty of Industrial Engineering and Innovation Sciences; 'Corporate Entrepreneurship'. I had chosen this course because of my interest in entrepreneurship. While exploring this new field of study I realized that this concept held many possibilities for the building industry.

When I came in touch with Corporate Entrepreneurship , I wrote down the potential I immediately though it could have for the building industry in a document called 'potential graduation topics'. About half a year later, my graduation year started. I attended an information meeting about how graduation works, and how to choose your topic. I very clearly remember that the person that gave the presentation said; do not choose a new and complicated topic; just choose something that has been done before, alter it a bit, add something small to it. And that's that; your gradation. I was indignant. Was this supposed to be a university or what? So I decided to be stubborn and ignore this advice completely. Perhaps it was a stupid thing to do, but I am still very happy I with the choice I made.

I returned to my document of potential graduation topics, and immediately knew what it should be: Corporate Entrepreneurship in the building industry. A topic that does not necessarily fit perfectly with my educational background, but that speaks to me personally. Something that had never been investigated before, something new. I always wanted my graduation thesis to be different from the bulk. Not another thesis about refurbished offices, or sustainability. But something I was passionate about, not just interested in.

In February 2015 I began, very enthusiastically, with my project. I had found a company that supported my idea (Bouwend Nederland) and had gotten the OK from the university. But then, in March 2015, my mother died. Suddenly and unexpectedly she ended her life after a year of psychical problems. Nothing was important anymore, my graduation completely meaningless. I had to find a new way to live my life, adapt myself to this new reality I was experiencing. The sadness completely overtook me, the hospital where she was in a coma for days, the funeral arrangement, and the after match of all this consumed me completely.

My graduation suddenly seemed so unimportant and such a huge task that I didn't know if I could ever finish it. But soon after, I was stubborn again. I was not going to let my mother's passing be the end of me. I hadn't spent 5 years of hard work on an education just to quit on the final steps. So I talked to my supervisors who were very kind and understanding. They told me to take all the time I needed. To just see my graduation as a way to stay in touch with normal life. And so I used it to regain a 'normal' day with a few hours of work, no matter how unimportant that work seemed.

It is now one year since my mother died. I still think about her every day. And I know I have changed. I had to change. Circumstances did not allow me to stay the same person I was before. And somehow, I feel more like myself now, as if I was always mend to be the person I am now. My actions and choices match better with my personality. I had to change, to reinvent myself. And this has cost me time, money, and a lot of effort. And in this lies the similarity with my graduation project. It is also about reinventing yourself, about choosing a new path that matches the changed circumstances. About investing time, money, and effort to become an improved version of yourself. This investment should be made by people who go through something I went through, but it is just as true for organizations in the changing and complex building industry.

I want to thank all the people who helped me with my project. So many people deserve thanks, that I cannot all mention them here. My special thanks to Timo, Papa, and my siblings Piep, Bar and Masje. Thanks to all my friends for all the 'tea and talk' time. My graduation supervisor Arjan, who was always very understanding and supporting. My other supervisors that took the time to help me. Furthermore, I would like to thank all the people who have made my graduation possible by letting me interview them, by participating in the questionnaires, and everyone who gave me advice on small or large parts of my graduation.

Andrea

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Management summary – English

The lack of innovation in the building industry is perceived by both governments and academia. This deficiency has several causes such as; the market structure, the fragmented nature of the industry, the reward system, and the lack of investment in R&D. Increasing the innovativeness of the industry is a main concern because it will create benefits on several levels; (1) societal, for it will increase the economic value of the building industry. (2) Organizational, for it will create competitive advantage for organizations. And (3) individually, for it will benefit all users and client of buildings since a more innovative industry leads to lower cost for building.

Over the last decade, the concept of Corporate Entrepreneurship has gained popularity; the phenomenon is discussed and researched by many and is perceived as a sound way to enhance innovation in an organization. Corporate Entrepreneurship is defines as *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets, or industries in order to create or sustain competitive advantage"* (Covin and Miles, 1999). It is about the creation of a business environment that fosters entrepreneurial thinking and behavior, and thus innovation. This environment is created by adding and changing certain organizational attributes.

This study looks into the possible translation of the existing Corporate Entrepreneurship concept for the Dutch building industry as a way of enhancing its innovativeness. The main research question of this study is: *"Can the Corporate Entrepreneurship concept be used to increase the innovativeness of the Dutch building industry?"*

This main question is answered via several sub questions:

SRQ 1. What is the current state of innovation in the building industry?

SRQ 2. What is Corporate Entrepreneurship and what organizational and environmental attributes does it require?

SRQ 3a. Can Corporate Entrepreneurship be used in the building industry, and if so; which attributes of Corporate Entrepreneurship can be used to enhance innovation?

SRQ 3b. What makes the building industry different than other industries that employ Corporate Entrepreneurship?

SRQ 4. Which attributes are the most influential when employing Corporate Entrepreneurship in the building industry?

SRQ 5. How can an organization in the building industry employ Corporate Entrepreneurship in order to enhance its innovativeness?

The first step towards the final answer is a literature review. This review makes the connection between the problems in the building industry, the solution offered by Corporate Entrepreneurship, and the link between them. This link is found in a tripartite way. The first link is related to the specific nature of the building industry; its project based character. Corporate Entrepreneurship is already proven to be beneficiary to other project based firms, this indicates that it could be useful for the building industry as well. The second link is the overlaps between literature on the increase of innovation in the building industry and literature on Corporate Entrepreneurship. Many organizational attributes that are addressed by literature on innovation in the building industry, match organizational attributes that Corporate Entrepreneurship focusses on. The third link is the industry characteristics that increase the beneficial potential of Corporate Entrepreneurship in other industries. These characteristics are (1) high competition, (2) business risk character, and (3) the

need to be competitive. The link between Corporate Entrepreneurship and the building industry is further endorse by interviews conducted amongst several people involved in innovation in the building industry.

With the strong indication that Corporate Entrepreneurship might be used to increase the innovativeness of the building industry, a theoretical framework is developed. This framework shows the organizational attributes of Corporate Entrepreneurship, the specific innovation incentives derived from literature, and the barriers to innovation that are part of the nature of the Dutch building industry.

The validation of this theoretical framework is the next objective of this study. This is done by employing the Fuzzy Delhi Method (FDM), a research method that uses a group of experts and two rounds of questionnaires to validate and weigh a list of attributes. The input for the first questionnaire is the attribute list derived from the theoretical framework. The second survey researches the validated attributes and asks experts to weigh them on a triangular scale; its minimum effect, its optimum effect, and its maximum effect on innovation in the building industry. This second questionnaire leads to a ranking of attributes. The most influential attributes to improve the innovative performance of a building organization are:

1. Top management support;
2. The organization offers resources to members to employ entrepreneurial activities;
3. Entrepreneurial attitude and performance of entrepreneurial activities are part of the organizational culture;
4. The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge);
5. The organization uses projects to test and implement innovations;

Besides these incentives, the second questionnaire also evaluated the attributes that hinder innovation in the Dutch building industry. The highest ranking barriers are:

1. Traditional contract forms;
2. Limited investment in research;
3. The fragmented nature of the building industry;
4. The role of the client;
5. The industry has a low perceived innovation-drive level.

These attributes can be used as practical input for building organizations, as well as to offer a foundation for future research on this topic. The practical usefulness of the FDM study is portrayed in a tool that gives an organization the opportunity to self-asses their entrepreneurial performance, and thus their effort to increase innovation. The results of this assessment can be used to evaluate the organization and to find steps an organization can take to improve its innovativeness.

All in all, the research question *"Can the Corporate Entrepreneurship concept be used to increase the innovativeness of the Dutch building industry?"* can be answered affirmative. Corporate Entrepreneurship can be used to increase the innovativeness of the industry as it offers a new perspective to organization as to where and how to generate and employ their entrepreneurial potential to develop new ideas and innovations, and thus become more competitive and profitable.

Management samenvatting – Nederlands

Het gebrek aan innovatie in de bouw wordt algemeen erkend. Dit tekort is ontstaan door een aantal zaken zoals; de markt structuur, het gefragmenteerde karakter van de sector, het beloningssysteem, en een gebrek aan investeringen in Research en Development. Het stimuleren van innovatie in de bouw kan een aantal belangrijke voordelen opleveren op diverse schaalniveaus; (1) de maatschappij. Meer innovatie, betekend een betere economische prestatie van de sector, en leidt dus tot een positieve bijdrage aan de algemene economie. (2) De organisatie. Meer innovatie leidt tot een betere concurrentiepositie. En (3) gebruikers. Hoe innovatiever de bouw is. Hoe goedkoper het zijn diensten en producten kan leveren, dit is gunstig voor iedereen die een gebouw gebruikt en/of koopt.

Het concept 'Corporate Entrepreneurship' heeft de laatste jaren veel terrein gewonnen. Het is een door vele onderzochte en gebruikte manier om innovatie binnen een organisatie te stimuleren. Het wordt gedefinieerd als *"de aanwezigheid van innovatie, plus de aanwezigheid van de doelstelling om organisatie, markten of industrieën te verjongen of te herdefiniëren om een concurrentievoordeel te behalen"* (Covin en Miles, 1999). Het draait om het creëren van een milieu dat ondernemend denken en handelen stimuleert om zo innovatiever te worden. Dit milieu wordt gecreëerd door een aantal organisatie variabelen aan te passen en toe te voegen.

Deze studie kijkt naar de mogelijkheden om dit concept naar de Nederlandse bouw te vertalen om op die manier de innovatie kracht van de sector te vergroten. De hoofdvraag van dit onderzoek is: *'Kan Corporate Entrepreneurship worden toegepast om innovatie in de bouw te vergroten?'*

Deze onderzoeksvraag wordt beantwoord met behulp van de volgende sub vragen:

SRQ 1. Wat is de huidige toestand in de bouw?

SRQ 2. Wat is Corporate Entrepreneurship en uit welke organisatorische- en omgevingsvariabelen bestaat het?

SRQ 3a. Kan Corporate Entrepreneurship worden toegepast in de bouw, en zo ja; welke variabalen van Corporate Entrepreneurship kunnen gebruikt worden om innovatie te vergoten?

SRQ 3b. Wat maakt de bouw anders dan andere industrieën die Corporate Entrepreneurship gebruiken?

SRQ 4. Welke variabelen zijn het meest invloedrijk wanneer men Corporate Entrepreneurship in de bouw wilt toepassen?

SRQ 5. Hoe kunnen organisaties in de bouw Corporate Entrepreneurship gebruiken om innovatie te stimuleren?

De eerste stap richting het beantwoorden van de onderzoeksvraag is het uitvoeren van een literatuur onderzoek. Dit onderzoek bekijkt de link tussen de problemen in de bouw, het concept Corporate Entrepreneurship, en de link tussen deze twee. Deze link is gebaseerd op drie delen. Het eerste deel is het projectmatig karakter van de bouw. Corporate Entrepreneurship wordt al toegepast is andere projectmatige industrieën. De tweede link is de overeenkomst tussen literatuur over het stimuleren van innovatie in de bouw, en Corporate Entrepreneurship. Veel organisatorische variabelen die worden genoemd in onderzoek naar innovatie in de bouw, maken ook deel uit van het concept. Het derde deel van de link is gerelateerd aan specifieke karakteristieken van de bouw die het geschikt maken voor Corporate Entrepreneurship, zoals het risico karakter en de hoge mate van concurrentie. De link tussen de bouw en Corporate Entrepreneurship wordt verder onderbouw tijdens diverse interviews met personen die werkzaam zijn op het gebied van innovatie in de bouw.

Deze sterke indicatie dat Corporate Entrepreneurship iets voor de bouw zou kunnen beteken in de basis voor een theoretisch kader. Dit kader laat de organisatorische variabelen van Corporate Entrepreneurship zien, samen met eerder voorgestelde maatregelen om innovatie in de bouw te stimuleren. Om een compleet beeld te krijgen, worden ook de bouw-gerelateerde variabelen gegeven die innovatie in de bouw hinderen.

Validatie van het theoretisch kader is het volgende onderdeel van dit onderzoek. Dit wordt gedaan door gebruik te maken van de Fuzzy Delphi Methode, een onderzoeksmethode die een groep experts twee vragenlijsten voorlegt en daarmee variabelen valideert en een gewicht toekent. De input voor de eerste vragenlijst bestaat uit de variabelen van het theoretisch kader. De tweede vragenlijst onderzoekt de gevalideerde variabelen verder door experts te vragen ze met drie punten te beoordelen; hun minimale effect, hun optimum, en hun maximale effect op innovatie in de bouw. Hieruit ontstaat een ranking van variabelen. De variabelen met de grootste positieve impact op de innovatieve presentaties van een bouwbedrijf zijn;

1. Top management support;
2. De organisatie biedt middelen aan medewerkers om ondernemende activiteiten uit te voeren;
3. Een ondernemende houding en het uitvoeren van ondernemende activiteiten maken deel uit van de organisatie cultuur;
4. De organisatie biedt middelen aan medewerkers om innovatieve activiteiten uit te voeren;
5. De organisatie gebruikt project om innovaties te testen en te implementeren.

De variabelen met de grootste negatieve impact om innovatie in de bouw zijn;

1. Traditionele contractvromen;
2. Gebrek aan investering in R&D;
3. Het gefragmenteerde karakter van de bouw;
4. De rol van de opdrachtgever;
5. De industrie heeft een lage innovatie-drive.

Deze resultaten kunnen worden gebruikt als praktische input voor een bouwbedrijf, en is ook een bron van informatie voor verder onderzoek. De praktische toepasbaarheid van het FDM onderzoek blijkt uit de ondernemerschapstool die eruit is ontstaan. Deze tool maakt het voor bouwbedrijven mogelijk om een self-assesment uit te voeren over hun prestaties op het gebiedt van Corporate Entrepreneurship. De resultaten uit de tool kunnen gebruikt worden als input om te bepalen welke stappen het bedrijf is de toekomst nog kan maken om innovatiever en ondernemender te worden.

Samengevat, de onderzoeksvraag '*kan Corporate Entrepreneurship worden toegepast om innovatie in de bouw te vergroten?*' kan bevestigend beantwoord worden. Corporate Entrepreneurship kan gebruikt worden om innovatie in de bouw te stimuleren door nieuw inzicht te bieden in hoe een bedrijf zijn ondernemende potentieel kan benutten met als resultaat het ontwikkelen van nieuwe ideeën en innovaties en zo een meer concurrerend en succesvol bedrijf te zijn.

Abstract

One of the main issues in the building industry is the lack of innovation. In order to solve this problem, this study look at the concept of Corporate Entrepreneurship. The objective of this concept is to create a business environment that fosters entrepreneurial thinking and behavior. It has been widely accepted as a sound way to improve innovation, and has proven its value in companies like Google, IBM, and Panasonic.

The translation of this concept to the Dutch building industry it done in several steps. A literature review results in a theoretical framework that shows which organizational attributes can be employed when incorporating Corporate Entrepreneurship. This theoretical framework is later validated and elaborated by the Fuzzy Delphi study. This study creates a validated and weighted list of attributes.

This list of attributes proves its practical value in the entrepreneurship tool that is also developed in the perspective of this research. This tool is a self-assessment for building organizations in which they can evaluate their current performance on Corporate Entrepreneurship and stimulating innovation. The tool results can be used to find a road ahead, a road towards a more innovative building industry.

Keywords: Corporate Entrepreneurship, building industry, increasing innovation, Fuzzy Delphi Method, entrepreneurship tool, organizational attributes.

1. Introduction

1.1 Problem definition

The Dutch Ministry of Economic Affairs has stated that the building industry lacks innovative character. The Dutch building industry is less innovative than other sectors and the main reason for this limited innovative power is the specific market structure of the building industry (de Bruijn and Maas, 2005). The current state of the innovativeness of the building industry is mapped in a report created in commission of the Dutch Ministry of Economic Affairs in 2005. In summary the issues related to innovation in construction can be summarized as followed (de Bruijn and Maas, 2005):

1. Building and construction displays little innovation compares with other sectors;
2. Main cause of the limited innovative power is the market structure in building and construction;
3. Significant differences in innovation power exist between the building and construction sub-systems;
4. Building and construction companies work relatively frequently with competitors and are less oriented towards customers in their innovation processes;
5. Small and medium size enterprises in building and construction are, as in other sectors, significantly less innovative than the large companies;
6. Innovation pays off, in building and construction too.

This lack of innovation in the building industry is not solely a Dutch problem. This problem is addressed in many international studies such as the Egan Report (1998), the building for growth report (1999) and the Construct for Excellence report (2001). All these studies show that the building industry has a lack of focus and investment in Research and Development and therefore is- relative to other industries- not innovative (Dulaimi, Ling, Ofori, and de Silva, 2002). While innovation has been given increasing importance in other industries (O'Connor and Rice, 2001), the construction industry continuous to struggle with deficiencies and inefficiencies (Egan, 1998). There is a low level of R&D activities and innovation that can be seen as significant barriers that restrict the development of the building industry (Dulaimi et al, 2002).

The least innovative sector in the construction industry is the residential and utility building sector (together this will be defined as 'the building industry'). This sector encounters the highest barriers for innovation when compared to other sectors as ground construction, road construction and hydraulic engineering (de Bruijn and Maas, 2005). Therefore, the building industry will be the focus of this research.

Lack of innovation: the reason

The main constraint for the creation of innovation in the building industry is the market structure. Building companies that overcome this hurdle are confronted with similar problems as companies in other sectors that search for innovation. Laws and regulations, as well as a lack of flexibility, are seen as main issues that hinder innovation. It is thus necessary to not only focus on technological innovation, but also organizational renewal (de Bruijn and Maas, 2005).

Davidson (2013) states that the lack of innovation in the building sector has its roots in the characteristics of both innovation itself and those of the building sector. Two characteristics of the building industry are; (1) all building projects are multi-industry (they have a heterogeneous composition) and all actors are involves in more than one project with different demand on time and input; and (2) each building project is carried out by a 'temporary multi-organization' where selection processes of participant are based on 'traditional methods' such as tendering. These characteristics create a fragmented industrial context in which it is difficult to see who has the responsibility and motivation to innovate.

An addition to these restraining variables is given by Winch (1998) who states that the building industry has; (1) a disproportionately orientation towards product enhancement rather than process improvement; (2) the characteristics of the industry as a complex system; and (3) roles in a project are shared and full responsibility is avoided. This is also endorsed by Dulaimi et al. (2002) who state that a lack of innovation in the building industry is caused by the segregation of design and construction activities.

The need for innovation

Previously, it is identified that there is a lack of innovation in the building industry, and the reasons behind this. Innovation can have several benefits, and therefore the lack of it is a problem. These possible benefits of innovation are stated here.

Davidson (2013) states various reasons why innovation is important; (1) attracting a larger 'slice of the pie', improve one's part in the project activity or budget and thus increase profitability; and (2) penetrating a new market and thus attaining a competitive advantage over others. This perspective is also supported by Seaden et al. (2003) who states that *"innovation is becoming the principal competitive tool to achieve greater market penetration and increased profitability."* The Innovatie in de bouw report (de Bruijn and Maas, 2005) also subscribes this statement as it states *"innovative companies experience greater workforce growth than non-innovative companies, and this is just as true for building and construction as for other sectors."*

Blayse and Manley (2004) subscribe the importance of innovation in building in relation to the economy. In most countries, the building and construction industry account for about 15% of the national product. The higher the level of innovation in the building industry, the greater the likelihood that it will increase its contribution to economic growth. This perspective is shared by Miozzo and Dewick

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(2004) who state: *"Despite the economic significance of the building industry and despite it being the creator of the build environment within which most economic activities take place, there are few scholarly analyses of innovation in construction [..]"*. The importance of innovation in the building industry for the economy is emphasized by the Dutch government who states that *"the competitiveness of prosperous countries as the Netherlands lies in innovation, [..], the development and implementation of new products, markets and production processes. For the building industry is the need for change larger than for other sectors [..] since it has a relative low innovativeness when compared to other sectors"*. (TNO, 2005).

Another reason why innovation in construction is important is provided by Graham Winch (1998). He states that "*such attempts (on innovation) have repeatedly failed, with the result that the relative cost of housing compared to other goods and services has been rising inexorably*". This shows that innovation does have potential benefits for not only the organization itself, but also for the customer who gets a better product for a better price. This reason is also supported by the Dutch government as they state that innovation in construction is a primary concern because it will enhance constant improvement of products and processes which will results in a better fit between the product and the needs of customers and society (Nijhof, Karssing, Wirtz, de Bruijn, 2008)

1.2 Research question

Chapter 1.1 defines the problem that will be the central issue of this report; the lack of innovation in the building industry. This problem will be connected to an innovation creation method called 'Corporate Entrepreneurship'. This concept is already successfully used in other industries and is named as a potential beneficial concept for the building industry. Satiawan, Erdogan, and Ogunlana (2012) state that 'due to the project based nature, high competition and business risk characteristics of the construction industry, entrepreneurship is considered very important for sustaining and improving the performance of contractors'. They also state that more academic studies are necessary in order to investigate the relationship between Corporate Entrepreneurship variables and the construction industry. This study will focus on going beyond a theoretical framework as offered by Satiawan et al. (2012) and looks into the possibilities that the concept of Corporate Entrepreneurship offers for the building industry by looking at characteristics of the industry and match them with the characteristics of the concept.

In summary, an increased level of innovation in the building industry can have benefits on three different levels. (1) It can help an organization with the creation of competitive advantage. (2) It can support the industry as a whole to function better and create more profit which is favorable for the national economy. And third, (3) it can support the creation of products and services that better fit the customers' needs and demands.

The main research question will therefore be:

Can the Corporate Entrepreneurship concept be used to increase the innovativeness of the Dutch building industry?

In order to answer this research question, several sub-questions are defined that will structure the research:

SRQ 1: What is the current state of innovation in the building industry?

SRQ 2: What is Corporate Entrepreneurship and what organizational and environmental attributes does it require?

SRQ 3a: Can Corporate Entrepreneurship be used in the building industry, and if so; which

attributes of Corporate Entrepreneurship can be used to enhance innovation?

SRQ 3b: What makes the building industry different than other industries that employ Corporate Entrepreneurship?

SRQ 4: Which attributes are the most influential when employing Corporate Entrepreneurship in the building industry?

SRQ 5: How can an organization in the building industry employ Corporate Entrepreneurship in order to enhance its innovativeness?

1.3 Research design

The report can be seen as an iterative sequence of theoretical work and model creation. The theoretical work will provide the background and input on which the model will be constructed.

A literature review provides information about the key concepts, boundaries, scope, context, and concepts that surround the research question. It supports the identification of the gap between what we know and what we need to know. The result of the literature review is a conceptual model and an evaluation of the theory (Webster, 2002).

Literature review

The literature review motivates the research topic and explains the contribution of this study. It provides a description of the key concepts surrounding the research topic and delineates the boundaries of the research. The literature review describes relevant prior literature in the main topic and related areas. The conclusion of the literature review is a theoretical model that guides future research. This model is justified by theoretical explanations, past empirical findings, and practical examples. The review presents implications for researchers and managers.

The theoretical model will be the foundation for the follow up study that evaluates the model and its

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The main research question will therefore be: *Can the Corporate Entrepreneurship concept be used to increase the innovativeness of the Dutch building industry?*

building blocks, the attributes. These attributes will be validated and scored by employing the Fuzzy Delphi Methodology.

Fuzzy Delphi Methodology

The Fuzzy Delphi methodology uses the opinion of experts, and the consensus between them, to establish weights to validated attributes. This method works with several rounds of questionnaires (in most cases, two). The first round is about the validation of the predefined attribute list. In this case, this list will be the attributes as derived from the literature review and are the components of the theoretical model. The second survey will then ask the experts to score these attributes in order to establish their weight and relative ranking. The research design is given in figure 1.1.

1.4 Expected results

The expected result consists of several components. The main component is a validated attribute model that will provide insight in which attributes are most valuable when purposefully using entrepreneurship to increase innovativeness of existing organizations. This results can be translated into a tool that organizations could use to measure their current innovative entrepreneurial status, and help them to establish what road they can take to improve themselves.

Originality and value

There is very little research concerning the implementation of Corporate Entrepreneurship in the building industry. The existing literature on this topic is solely exploratory. This study will focus on going beyond such a theoretical framework as offered by Satiawan et al. (2012) and look into the possibilities that the concept of Corporate Entrepreneurship offers for the building industry by looking at characteristics of both the concept and the industry and thus offer insight in the organizational consequences when implementing Corporate Entrepreneurship in the building industry.

1.5 Reading guide

This report is constructed in seven main parts.

1. The introduction; provides the problem definition, the research questions this study aims to answer, the research design and the expected result.
2. The Glossary; gives background information on key definitions and research approaches.
3. The literature review; offers insight in current scientific literature on the topic of innovation in the building industry and gives the basics on Corporate Entrepreneurship. Ends with the connection between these concepts in a theoretical framework.
4. The FDM study; a report of the FDM study conducted in order to validate the attributes found in the literature review, and weighs them.
5. The entrepreneurship-tool; explanation of the practical tool that is develop with the results of the FDM study.
6. Conclusion; provides the answers to the research questions, relevance of this study and a discussion.
7. References and Appendixes

Readers who want to find out about the main issues of this graduation are advised to read the management summary, the introduction, and the conclusion. If you want more information, a brief look at the text placed in text boxes gives a summary of the most important notions made in that section of the report.

Section three and four can be read separately from the report. However, it is advised to read the conclusion of part three before reading part four.

Several remarks about this report; (1) text in the purple sections on the right hand pages are citations from interviews or from the text. (2) Text placed in a light purple text box are short summaries of the most important notions on the section above.

Research Design

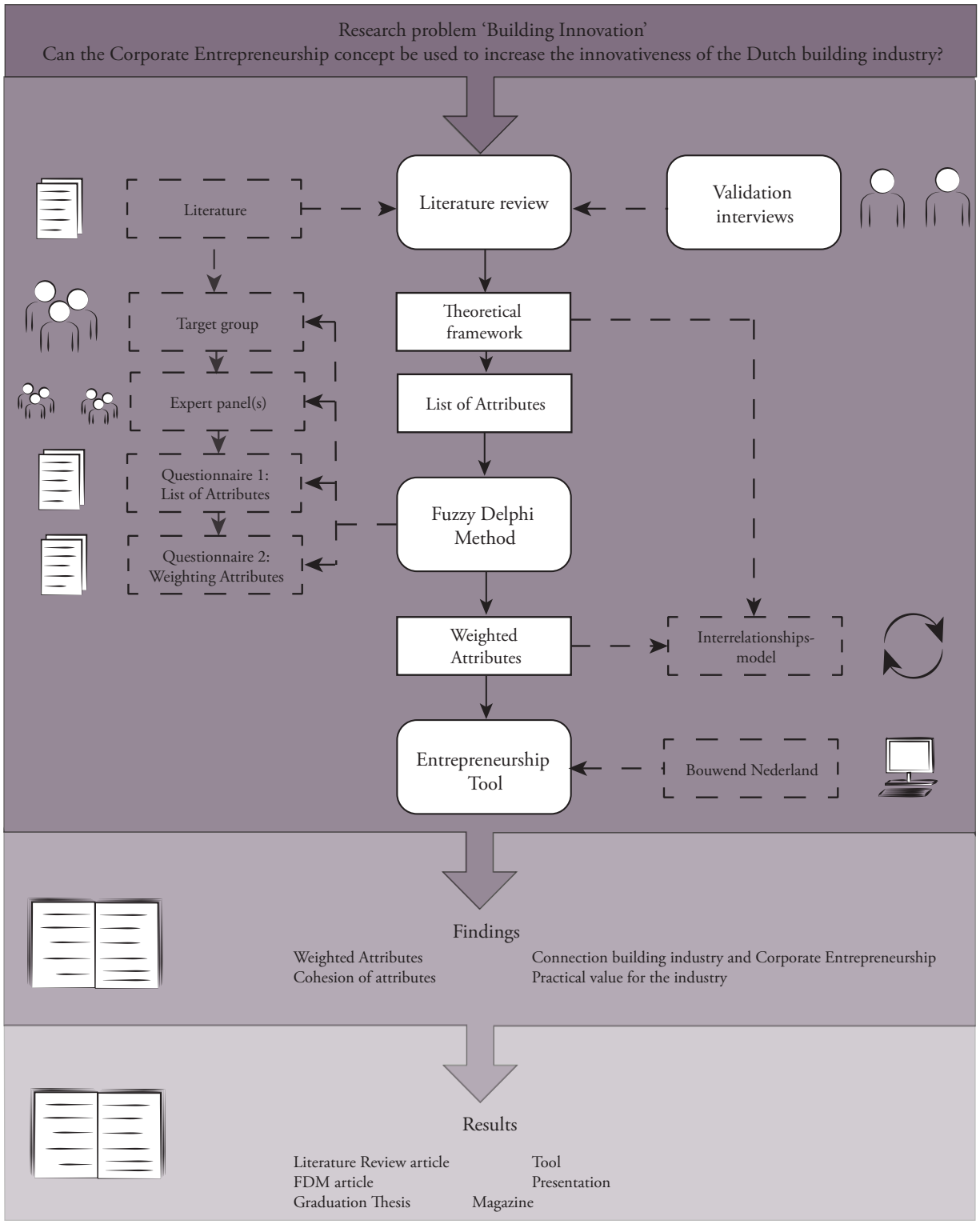


Figure 1.1 Research Design

2. Glossary

During this graduation project, several definitions, notions, and classification are identified. This chapter summarized the explanation of each by elaborating their background.

2.1 Definitions

This section provides an overview of definition of key concepts and important attributes. More definitions can be found in appendix A.

Building industry – Sector of industry that engages in building, alteration and repair of buildings. Includes different actors in the initiative, design, building, operation, and demolishing phase.

This definition is chosen since it is the most general accepted definition of the building industry. The building industry is a part of the more broad 'Construction industry' that incorporate the building industry (residential and utility buildings) and the GWW industry (ground-, infrastructural-, and water structures).

Corporate Entrepreneurship – The presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority.

Defining the concept of Corporate Entrepreneurship is difficult, since many researchers have made an attempt. This study makes its own attempt by reviewing definitions made in prior research.

Covin and Miles (1999) describe Corporate Entrepreneurship as one of three most common phenomena; (1) an established organization enters a new business; (2) an individual or individuals champion a new idea within a corporate context; (3) an entrepreneurial philosophy permeates an entire organization's outlook and operation. These phenomena are not multi exclusive, they can coexist within one organization. Covin and Miles (1999) focus on the third phenomenon and thus define Corporate Entrepreneurship as *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority."*

Another definition and concept description of Corporate Entrepreneurship is given by Barringer and Bluedorn (1999). Their main assumption is that Corporate Entrepreneurship is a behavioral phenomenon and all firms fall along a conceptual continuum that ranges from very conservative to highly entrepreneurial. Corporate Entrepreneurship in a firm means that the firm has to be risk-taking, innovative and proactive. A firm's entrepreneurial intensity is dependent on its internal corporate context, as well as its external environment. Three variables underlie a firm's capability to be entrepreneurial; (1) opportunity recognition; (2) organizational flexibility; and (3) a firm's ability to measure, encourage and reward innovative and risk-taking behavior. Their definition of Corporate Entrepreneurship is derived from the definition of entrepreneurship by Schumpeter (1936); *"Entrepreneurship as a process of creative destruction, in which the entrepreneur continually displaces or destroys existing product or methods of production with new ones."*

Dunlap-Hinkler et al. (2009) also base their Corporate Entrepreneurship definition on the work of Schumpeter. They describe two phenomena that surround Corporate Entrepreneurship: (1) the birth of new businesses or internal venturing, and (2) the transformation of organizations through renewed patterns of recourse deployment.

David Garvin and Lynne Levesque (2006) describe the challenge that companies face when pursuing

Corporate Entrepreneurship as a balance that the company has to strike between exploitation and exploration activities. This view is shared by many others including Lavie et al. (2010), Benner and Tushman (2003), and Birkenshaw and Gibson (2004). This balance can be pursued by practicing three acts; *"(1) develop strategy by trial and error which includes narrowing potential choices, learning from small samples, using prototypes to test business models, tracking progress through non-financial measures, and knowing how and when to pull the plug on a new venture; (2) find the best combination of old and new operational processes by staffing new ventures with 'mature turks', changing veterans' thinking, knowing which capabilities to develop and which to acquire, and having old and new businesses share responsibilities of operating decisions; and (3) strike the right balance of integration and autonomy by assigning both corporate and operating sponsors to new ventures, establishing criteria for handoffs to existing divisions, and using creative organizational structures."*

Kelley et al. (2009) state that Corporate Entrepreneurship contains two fundamental components; (1) objectives focused on rejuvenating or purposefully redefining organizations, markets and industries to create or sustain superiority; and (2) innovation as the premier mechanism for meeting these objectives.

Antoncic and Hisrisch (2003) define Corporate Entrepreneurship as *"entrepreneurship within an existing organization, referring to emergent behavioral intentions and behaviors of an organization which deviate from the customary way of doing business. Corporate Entrepreneurship processes go on in an existing firm, regardless of its size and refer not only to creation of new business ventures, but also to other innovative activities such as development of new products, services, technology, administrative techniques, strategies and competitive postures. The characteristics of Corporate Entrepreneurship include; new business venturing, product/service innovation, process innovation, self-*

Corporate Entrepreneurship is *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority."*
(Covin and Miles, 1999)

renewal, risk taking, pro-activeness and competitive aggressiveness."

Ireland, Covin and Kuratko (2009) define a Corporate Entrepreneurship strategy as *"a vision-directed, organization-wide, reliance on entrepreneurial behavior that purposefully and continuously rejuvenate the organization and shapes the scope of its operations through the recognition and exploitation of entrepreneurial opportunities."* They believe that Corporate Entrepreneurship is manifested through three elements; (1) an entrepreneurial strategic vision; (2) a pro-entrepreneurship organization architecture; and (3) entrepreneurial processes and behavior as exhibited across the organizational hierarchy.

Donald Kuratko, Duane Ireland and Jeffrey Hornsby (2001) state that *"Entrepreneurial actions are any newly fashioned behaviors through which companies exploit opportunities others have not notices or aggressively pursued. Novelty, in terms of new resources, customers, markets or a new combination of resources, customers and markets in the defining characteristic of entrepreneurial actions. It includes acts of creation, renewal or innovation within and outside an organization. It is important for firms facing rapid changes in industry and market structures, customer needs, technology and societal values."*

The conduct of Corporate Entrepreneurship

As can be seen above, many researchers have tried to define the concept of Corporate Entrepreneurship. These different descriptions of both the meaning and the organizational focus that are characteristics of a Corporate Entrepreneurial firm.

Table 2.1 shows that there are many recurring parts in different definitions of Corporate Entrepreneurship. This study adopt the definition as created by Covin and Miles (1999) because of their extended attention to prior research and attention towards different aspects of Corporate Entrepreneurship. They define Corporate Entrepreneurship as *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority"*(Covin and Miles, 1999). Their definition matches the desired state of the building industry as an innovative industry that focuses on the development and implementation of new products, markets and production processes (de Bruijn and Maas, 2005; Nijhof et al. 2008).

Innovation – Innovation is the actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change. The concept of innovation is defined differently throughout different industries. The definition provided by Slaughter (1998) is broadly accepted by academics and participants of the building industry (Blayse and Manley, 2004; Gambatese and Hallowell, 2011). Therefore, this definition will be used in this research; ''Innovation is the actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change' (Slaughter, 1998).

Innovation in often split into different forms. The most broadly accepted categorization is the distinction between 'technical innovation' and 'organizational innovation'. *"Technical innovation involves either product or process innovation, whereas organizational innovation includes changes to organizational structure, introduction of advanced management techniques, and implementation of new corporate strategic orientations"* (Blayse and Manley, 2004). Policies and strategies on the enhancement of innovation in the building industry should be focused on both types of innovation(de Bruijn and Maas, 2005; Davidson, 2013). Another categorization of innovation is focused on field in which the innovation takes place. This categorization is related to different streams in the organization. Three streams are perceived; financial streams, product streams and information streams.

Table 2.1 literature on the definitions and description of Corporate Entrepreneurship

Authors	**Concept**					
	Organizational culture has entrepreneurial focus	Pursuit of new opportunities	Innovation	Purposeful behavior	Creative destruction	Competitive advantage
Covin and Miles (1999)	X	X	X	X		X
Barringer and Bluedorn (1999)	X		X	X	X	
Schumpeter (1936)					X	X
Dunlap-Hinkler et al. (2009)	X	X				
Garvin and Levesque (2006)	X	X				
Lavie et al. (2010)		X				
Benner and Tushman (2003)		X				
Birkenshaw and Gibson (2004)		X				
Kelley et al. (2009)	X		X	X		
Antoncic and Hisrisch (2003)	X	X	X	X		X
Ireland, Covin and Kuratko (2009)	X	X		X		
Kuratko, Ireland and Hornsby (2001)		X	X			X

2.2 Definition of attribute-elements

This study's objective is to create an attribute framework that represents the employment of Corporate Entrepreneurship in the building industry. These attributes consist of a number of key elements that are defined and explained here.

Attribute element	**Explanation**
Organizational structure	The hierarchical arrangement of lines of authority, communication, rights, and duties of an organization. It determines how roles and responsibilities are assigned, controlled and coordinated, and how information flows through the organization.
Resources	A source or supply from which benefit is produced. For example; time, money, knowledge, material, energy, staff.
Mistakes	To understand, interpret, or evaluate wrongly.
Conflict	A collision or disagreement between one, two, or more parties.
Status quo	The existing state of condition.

Projects	Projects are temporary organizations involving teams of individuals from within a single firm or from multiple firms. A project performs a time-sequenced set of interdependent activities to achieve pre-defined goals or conform to specifications. Projects are initiated to accomplish tasks that do not occur sufficiently often to warrant the establishment of an enduring organization.
Business cases	A project management document that describes and depicts the business considerations of a project. It usually incorporates a cost-benefit analysis.
Top management support	The top management of an organization exist of the highest tanking executives responsible for the entire organization. Top management support is present when these top managers add an issue to their daily practices, and translate it into policy, goals, objectives, strategy, and vision.
Scanning activities	The managerial activity of learning about trends and events in the environment of the organization.
Organizational network	The network of an organizations existing of all unities present is the organizations' environment that the organization has contact with. This can be competitors, clients, users, experts, etc.
Vision	The desired achievement of an organization in the mid-term or long-term future.
Organizational culture	The values and behaviors that contribute to the unique social and psychological environment of an organization.
Entrepreneurial activities	Activities that are linked to entrepreneurship. This includes creating new ideas, designing, launching, and running new products and/or services.
Risk	Exposure to a hazard or dangerous chance.
Reward system	Structure that is responsible for incentive salience and reinforcement. It encourages a desired behavior by offering a reward in return for that behavior.
Research and Development	Systematic activity combining both basic and applied research, and aimed at discovering solutions to problems or creating new goods and knowledge. It may result in ownership of intellectual property such as patens
Reflective practitioner	A person that is capable to reflect on its actions and perceives this in the perspective of the process of continuous learning.
Fragmented nature	Different phases in a building process are separated from each other by time and/or place. In many cases the design, build, maintain and operating phase are separated and executed by different teams.
Market structure	The interconnected characteristics of a market, such as the strength of buyers and sellers.
Laws and regulations	The set of jurisdiction that applies in a district.
Traditional contract forms	Traditional contract forms in the building industry are contract that follow a conservative guideline. These types of contracts have been in use for a long period of time. Traditional contract are mostly based on a tendering procedure where price is the determent.
Innovation-drive level	This level represents the drive that an entity has to think and act innovative.

2.3 Research approach: the Fuzzy Delphi method

The Fuzzy Delphi Method in an analytical method that is founded on the Delphi Method and that bases its ideas on the Fuzzy Theory. FDM is a research method that uses collective decision-making to establish weights to attributes. There are several rounds of anonymous questionnaire surveys that ask experts for their opinion. The purpose of the method is to provide a consensus between experts (Ho and Wang, 2008). The FDM uses a fuzzy numbers scale in order to evaluate the agreement degree between experts. This results in a consensus coefficient that can be used to diminish the overall fuzziness of the surveys.

FDM is founded on group thinking of qualified experts that assures the validity of collected information (Glumac, 2007; Ho and Wang, 2008).

The literature that is the foundation for the Fuzzy Delphi Method is schematized in table 2.2.

Table 2.2 Literature on FDM

Author(s)	**Concepts**							
	The Delphi Method	Application of Delphi method	Modification in DM	Reasons to use FDM	FDM research process	FDM requirements	(de) Fuzzification	Consensus calculation
Adler & Ziglio (1996)		x				x		
Chang, Huang, & Lin (2000)				x	x			x
Chen (2014)							x	
Cheng & Lin (2002)				x	x		x	x
Christie & Barela (2005)								x
Coates (1975)		x						
Dalkey & Helmer (1963)	x							x
Delbecq et al. (1975)	x			x	x	x		
Giannarou & Zervas (2014)							x	
Glumac et al. (2012)				x	x	x	x	
Gupta & Clarke (1996)	x	x						
Ho and Wang (2008)				x	x	x		
Hsu & Chen (1996)			x					
Ishikawa et al. (1993)			x					
Kittel-Limerick (2005)								x
Murray et al. (1985)			x					
Noorderhaven (1995)			x	x				
Rowe et al. (1991)		x		x		x		
Seissing et al. (2013)					x		x	
Turoff (1970)	x	x	x					
Zhang & Xing (2010)							x	

Methodological steps

The Fuzzy Delphi procedures exists of three phases. The first phase focusses on the identification of experts. The desired size is 10 to 15 experts per panel. Each panel should be exist of a homogenous group of experts. The members can be located by reviewing literature and the identification of relevant disciplines and organizations. The next phase is the brainstorming phase in which the collection of attributes from literature is the starting point. This list of attributes is sent to the experts in order to create a final version of the list of relevant attributes. The third phase is focused on assigning weights to all attribute. The final result of this research is a list of attributes that are ranked and weighted by experts (Glumac, 2007).

The methodological steps in the FDM are (Glumac, 2007):

Step	Explanation
Step I – Validate the predefined list of attributes	Participants fill in a questionnaire in which they approve attributes from the predefined attribute list and if necessary they add missing attributes. The predefined attribute list is based on a literature study.
Step II – Weighting of attributes	A second questionnaire is distributed amongst the participants. In this questionnaire, they score all validated attributes in a three-point way; its minimum value, its optimum value, and its maximum value.
Step III – Set up fuzzy numbers	The scores applied in the second survey are translated to fuzzy numbers
Step IV - Defuzzification	Transform the fuzzy results gained from the second survey into real numbers.
Step V - Screening	Screen the attributed scores by comparing their crisp value to a threshold value. Attributes that fall below this value are less important, attributes that fall above this value are more important.
Step VI – Expert panels	Use the results from the previous steps in order to determine possible differences between expert panels.

Selection of target groups: the experts

The selection of the right expert groups deserves much attention in FDM, since it does not derive its results from a huge database or survey group. FDM is a support tool for decision making, and the experts are required to have thorough knowledge of the subject, in this case Corporate Entrepreneurship in the building industry. As a consequence, the selection of the experts is essential for the quality of the results. An appropriate distinction between expert groups is essential. When groups are too homogeneous, there will be either no consensus or results will be meaningless since comparison is impossible. Each panel should consist of 10-15 people as recommendation for homogeneous groups (Glumac, 2007).

3. Corporate Entrepreneurship in the building industry: a literature review

P.A. Snijders – Eindhoven, University of Technology

Abstract

Increasing the innovativeness of the building industry is considered to be one of its main challenges. This increase is desirable for it will create benefits on several levels; that of the society, the organization, and the individual customer. This literature review observes the building industry and its innovative performance. Over the last decade, the concept of Corporate Entrepreneurship has gained popularity; the phenomenon is discussed and researched by many and is perceived as a sound way to enhance innovation in an organization. Exploratory research indicates that Corporate Entrepreneurship could be useful in the building industry. Prior research stated that the project based nature, the high competition in the industry, and its business risk characteristics make the building industry a suitable match with the concept of Corporate Entrepreneurship as a way of sustaining and improving innovation performance. This study goal is to clarify the concept of Corporate Entrepreneurship and evaluating its possibilities in the building industry. Prior research is evaluated in order to create sound concept definitions as well as to identify attributes that will determine the success of Corporate Entrepreneurship in the building industry.

Keywords: Corporate Entrepreneurship, the building industry, innovation, organizational culture, organizational structure.

3.1 Introduction: the environment of the problem

The building industry is essential for the economic and social establishment of a country (Setianwan, Erdogan, and Ogunlana, 2012). Thus, it is important that it is a well-functioning industry that adds value to society both on socio-economic as well as on spatial level. There is a problem with the well-functioning of the building industry; and that problem is its innovativeness.

The problem

A deficit of innovation is perceived by both academia and governments which results in a non-optimal functioning building industry (Davidson, 2013; Dulaimi, Ling, Ofori, and de Silva, 2002; Hertog and Brouwer, 2001; Winch, 1998).

Prior research

The problem of innovation in the building industry is extensively researched by many academia. This prior research indicate the causes and offers several types of solutions. One of these types is the improvement of the organizational structure in order to stimulate innovation. This type of solution is extensively researched by many including: Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Ling, 2003; Sexton and Barrett, 2003; Winch, 1998.

How to read this article

This review will be founded on the objective of defining the barriers and incentive of innovation in the building industry in context of the concept of Corporate Entrepreneurship. The first part of this article will provide basic information about the environment of the problem: the building industry. Its characteristics and its problems regarding innovation are discussed in section 3.2. Section 3.3 describes the concept of Corporate Entrepreneurship; a business administration concept that focusses on an entrepreneurial structure as a tool to increase

innovation. In 3.4 the link between the building industry and Corporate Entrepreneurship is described. Section 3.3 describes prior research on the implementation of Corporate Entrepreneurship and their search for organizational variables that influence its success. In section 3.5 the conclusion of this review, as well as the discussion is depicted. All light purple frames are short summarize of a section. All dark purple frames are quotes either derived from the text, or from interview respondents.

"Innovation is a way of thinking, working, and communicating"

Interviewee's answer to the question 'What is innovation?'

3.2 The building industry

On the first of January 2015, there were over 1.46 million companies in the Netherlands. Almost 145.000 of these were active in the building industry. This makes it the third largest industry; right after specialist business services and trade (Bouwend Nederland, 2015). The building industry accounts for 7 to 15 percent of the national product (Blayse and Manley, 2004; OECD, 2010) and has thus a significant role in the economic performance of a nation. Alongside its economic significance, the building industry has a high impact on the environment (de Heas, 2001).The building industry greatly determines our surroundings and impacts daily lives.

Challenge: innovation

The building industry faces a big challenge when it comes to innovation (Davidson, 2013; Dulaimi, Ling, Ofori, and de Silva, 2002; Hertog and Brouwer, 2001; Winch, 1998). Government and academia agree that a lack of innovation has been part of the industry for decades. The Egan report (1998), the Construct for Excellence report (2001) and the *'Innovatie in de bouw'* report all show this lack of innovation and affirm its complications.

"There is a lack of consideration on how to apply innovation in different projects. Building projects are hard to combine with innovation."

Interviewee on the project based nature of the industry

Increasing the innovativeness of the industry is an important focus point. Innovation create benefits on different scales; (1) national, (2) organizational and (3) individual. The national benefits of an innovative building industry lies in its attribution value to the

national economy. Innovation leads to performance-enhancing, which leads to a more competitive and profitable sector (Blayse and Manley, 2004; de Bruijn and Maas, 2005; Miozzo and Dewick, 2004).

Innovation is also beneficial on (2) the organizational level. Innovation is a way to gain competitive advantage (de Bruijn and Maas, 2004; Davidson, 2013; Seaden, Guolla, Doutriaux, and Nash, 2003). This can be used to increase profitability in individual projects as well as in whole market (segments) (Seaden, Guolla, Doutriaux, and Nash, 2003).

(3) The benefits of innovation on the individual level are for the customers, consumers, and end-users. Winch (1998) states that the previous failure of innovation in the building industry has led to a relative high increase in the price of housing when compared to goods and services. Besides price, customer value could also be enhances by innovation (Nijhof, Karssing, Wirtz, and de Bruijn, 2008).

What is innovation?

Before the reasons behind the lack of innovation and the possible solutions for it are addressed, we should define innovation. Innovation is an ambiguous concept that is defined differently throughout different fields of research. The definition as provided by Slaughter (1998) is broadly accepted amongst academia in the field of building (Blayse and Manley, 2004; Gambatese and Hallowell, 2011)and will therefore be used in this study; *"Innovation is the actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change"* (Slaughter, 1998).

Innovation is often split into different categories. The most accepted categorization is the distinction between 'technical innovation' and 'organizational innovation'. *"Technical innovation involves either product or process innovation, whereas organizational innovation includes changes to organizational structure, the introduction of advanced management techniques, and the implementation of new corporate strategic orientations"* (Blayse and Manley, 2004). Policies and strategies that focus on the enhancement of innovation in the building industry should be focused on both types of innovation (de Bruijn and Maas, 2005; Davidson, 2013).

Characteristics of the building industry: barriers

The characteristics of the building industry make it a unique environment. Some of these characteristics are (part of) the reason behind the lack of innovation. 34% of employees in the industry indicate that the market structure is the reason for the lack of innovation, for business as a whole, this is 21% (de Bruijn and Maas, 2005). This indicates that the specific nature of the industry plays a role in the lack of innovation.

Many studies have indicated that the project based character of the industry is a main constraint towards innovation (Davidson, 2013; Dulaimi et al., 2002, Miozzo and Dewick, 2005, Winch, 1998). Building companies work together in temporary teams that vary between projects. This creates an absence of trust that both limits the knowledge exchange between project partners (de Bruijn and Maas, 2005) and creates an environment in which all project members try to avoid responsibility (Winch, 1998). Innovative activities are performance within a confines project, and are not expanded organization-wide.

A building project has a fragmented nature; each project step is performed by a different team, composed of different organizations. This results in an environment where nobody feels the responsibility and motivation to innovate (Davidson, 2013, Dulaimi et al., 2002). This feeling increases due to the predefinition of the project outcome in the first few project stages. These fully predefines prescript leave little room for innovation (de Bruijn and Maas, 2005).

Another issue frequently addressed by academia is the lack of investment in Research and Development (or: R&D) activities. This is combined with a lack of coordination between academia and the industry about research activities (Blayse and Manley, 2004; Dulaimi et al., 2002; Winch, 1998). Industries that perform poorly on R&D activities often lack innovative character (Dyer, Furr, and Lefrandt, 2014).

There are several other characteristics that play their part in the lack of innovation in the building industry. The traditional form of contracts, the cost of research, a lack of information about costs of innovations, and restrictions imposed by laws and regulations are all part of the problem (Ling, 2003).

We can state that the building industry had a general lack of promotion, recognition, and reward of creativity, quality of work, and innovation (Dulaimi et al., 2002). The characteristics as described in this section are the source of the problems surrounding innovation in the industry and should be taken into consideration when evaluating a proposed solution to the issue. An overview of these 'barriers to innovation' is provided in figure 3.1.

The lack of innovation in the building industry is eminent, and already several developments make a first attempt in the removal of the innovation barriers. Integral contracting focusses on the problems surrounding the fragmented nature of the industry. An example is DBFMO contracts (Design, Build, Finance, Maintain, Operate). Another development is the creation of new tendering procedures that focus on economic value (Total Cost of Ownership) instead of price.

Innovation in the building industry is undesirably low. This is due to the specific character of the industry. The barriers to innovation can be traced back to its market structure, the general employed rewards system, the fragmented nature of projects, and a lack of investment in R&D activities.

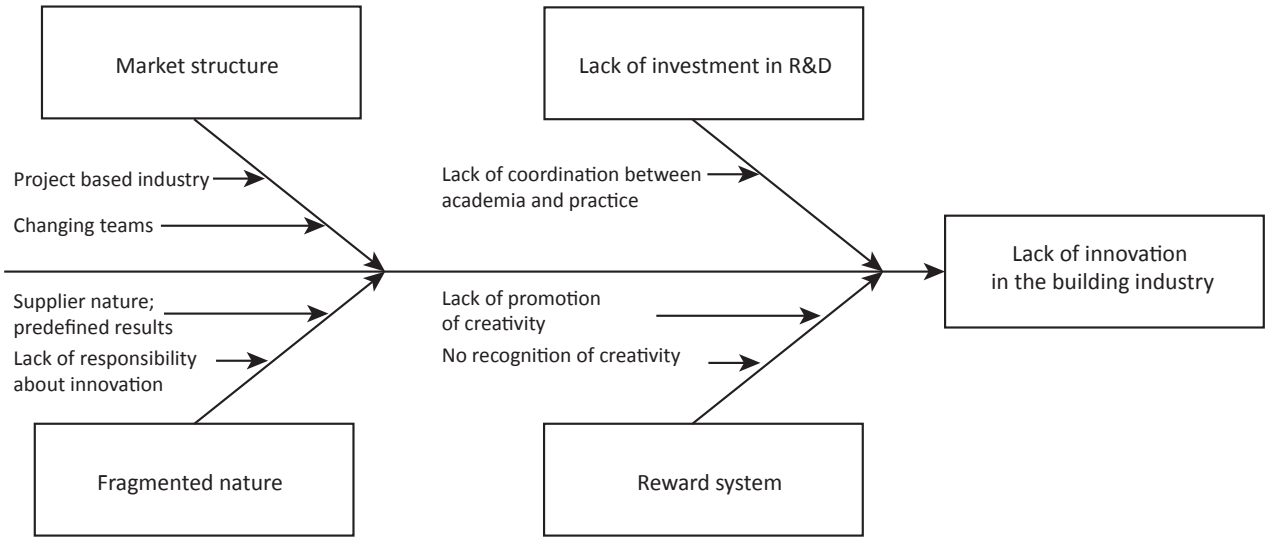


Figure 3.1 Barriers to innovation

Academic framework regarding the increase of innovation in the building industry

The previous defined barrier to innovation are provided by existing literature. As well as this problem identification, many academia provide a theoretical framework that provides a possible solution.

The unique character of the building industry requires adapted methodologies and procedures for innovation management. It should take into account (1) the project-based character of the industry, (2) the large number of project participants that form separate business units, (3) many project members are small or medium in size, (4) the industry has a fragmented nature, (5) there is a strong dependency on general economic conditions, (6) the client has a dominant role in the outcome, and (7) the industry in general has a low perceived innovation-drive level (Gumilar, Zarnic, and Selih, 2011).

Innovation management

Innovation management in the building industry should focus on (1) the dominant role of the client in the desired outcome of the projects (Blayse and Manley, 2004; Gamabatese and Hallowell, 2011; Winch, 1998) and (2) the promotion and enabling of greater integration in the value chain (Blayse and Manley, 2004; Dulaimi et al., 2002, Ling, 2003).

Instrumental variables

The instrumental variables that an organization should employ in order to enhance its innovativeness, is a common theme in academic work. These instrumental variables should match with the characteristics of both the organization and the building industry. The recommended instrumental variables are;

(1) An organizational culture that supports innovation. The organizational culture represents the system of shared beliefs and values that become manifest in the behavior and actions of organizational members. Advantageous cultural attributes that foster innovation include: (a) support and encourage employees to question the status quo, (b) toleration of unsuccessful ideas, and (c) the acceptance of conflict and constructive handling of them (Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Ling, 2003).

(2) The organizational strategy should emphasize the importance of innovation. Upper management support for the innovative focus of the organization of hereby essential for success (Blayse and Manley, 2004; Hartmann, 2006; Sexton and Barrett, 2003). The dedication of the upper management can be expressed by providing resources that enable innovation (Ling, 2003).

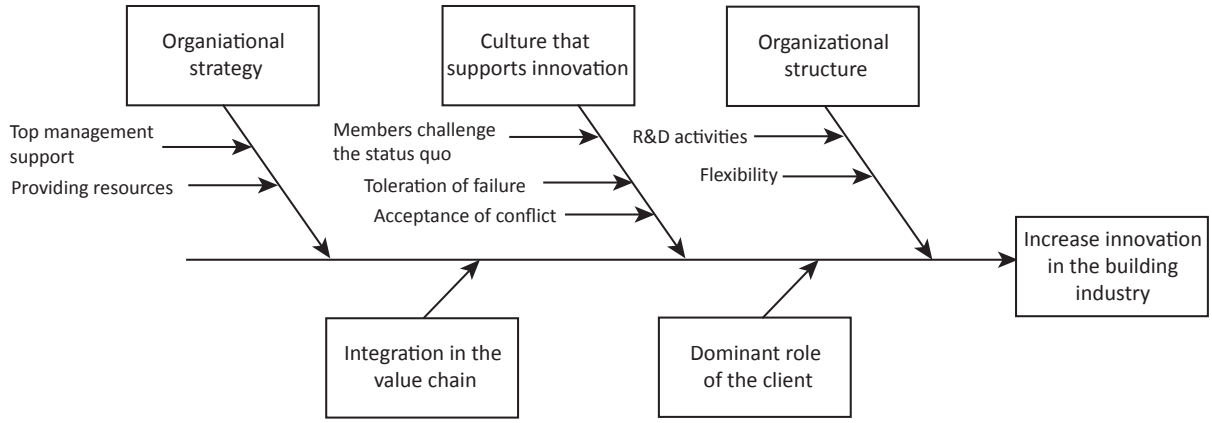


Figure 3.2 The enablers of innovation

(3) The organizational structure has to enable innovative activities (Gambatese and Hallowell, 2011; Hartmann, 2006; Winch, 1998). These innovative activities include R&D, a sound enabler of innovation (Dulaimi et al., 2002). Innovative activities are supported when the organizational structure offers more flexibility, in that way creating an environment suited for the pursuit of innovation (Ling, 2003; Winch, 1998).

The enables of innovation in the building industry as provided by existing literature are depicted in figure 3.2.

Academia have provided several possible attributes that might increase the innovativeness of the industry. These include (1) the role of the client, (2) integration across the value chain, (3) a culture supportive of innovation, (4) an organizational strategy that emphasized the importance of innovation, and (5) the organizational structure should encourage innovative behavior.

3.3 Corporate Entrepreneurship

Academia in the field of building and construction offer several possible solutions for the lack of innovation in the industry. Many of these solution can be traced back to the organizational structure and culture. This type of offered solutions will be the focus of this research.

Corporate Entrepreneurship is a concept founded in the field of Business Administration. It emphasizes on the increase of innovativeness of organizations by employing entrepreneurial behavior. This concept is internal oriented on the opportunities an organization itself can exploit and use to its advantage.

"The most devastation thing for innovation are the tender and building laws and regulations; they are hopelessly old-fashioned."
Interviewee's view on laws and regulations

"Fingers are pointed at the client; the lack of innovation is his fault. But the client only has a limited budget […] so you have to work together to create a sustainable revenue model (for innovation rev.)."
Interviewee tells about the client

Over the last decade, the concept of Corporate Entrepreneurship has gained in popularity. The phenomenon is discussed and researched by many and is seen as a sound way to improve product-, process-, or business model innovation in an organization (Covin and Miles, 1999; Ireland, Covin, and Kuratko, 2009). Corporate Entrepreneurship gets an increasing amount of attention in practice due to the realization of companies that they cannot shrink their way to success; companies must create, develop, and sustain new businesses in order to grow (Garvin and Levesque, 2006). Exploratory research indicates that Corporate Entrepreneurship could be implemented in the building industry. Setiawan, Erdogan, and Ogunlana (2012) state that the project based nature, the high competition in the industry, and its business risk characteristics make the building industry and Corporate Entrepreneurship a beneficial match when looking to create and sustain innovation performance.

The Corporate Entrepreneurship concept

Corporate Entrepreneurship has long been identified as a potential viable method for the promotion, creation and sustaining of competitive advantage (Covin and Miles, 1999). Despite a long attention to the phenomenon, one consistent definition of the concept is still to be found (Setiawan et al., 2012).

When different definitions are evaluated, several consistent characteristics of Corporate Entrepreneurship emerge. Corporate Entrepreneurship is seen as an organizational approach that focusses on innovation (Antonic and Hisrisch, 2003; Barringer and Bluedorn, 1999; Covin and Miles, 1999; Kelley, Peters, and O'Connor, 2009; Kuratko, Ireland, and Hornsby, 2001) and the pursuit of new opportunities (Benner and Tushman, 2003; Birkenshaw and Gibson, 2004, Dunklap-Hinkler, Mudambi, and Kotabe, 2010; Garvin and Levesque, 2006; Kuratko, Ireland and Hornsby, 2001).

Table 3.1 Finding the definition of Corporate Entrepreneurship

Authors	**Concept**					
	Organizational culture has entrepreneurial focus	Pursuit of new opportunities	Innovation	Purposeful behavior	Creative destruction	Competitive advantage
Covin and Miles (1999)	X	X	X	X		X
Barringer and Bluedorn (1999)	X		X	X	X	
Schumpeter (1936)					X	X
Dunlap-Hinkler et al. (2009)	X	X				
Garvin and Levesque (2006)	X	X				
Lavie et al. (2010)		X				
Benner and Tushman (2003)		X				
Birkenshaw and Gibson (2004)		X				
Kelley et al. (2009)	X		X	X		
Antoncic and Hisrisch (2003)	X	X	X	X		X
Ireland, Covin and Kuratko (2009)	X	X		X		
Kuratko, Ireland and Horsnby (2001)		X	X			X

In order to call an organization entrepreneurial, the activity of Corporate Entrepreneurship must be purposeful behavior (Antonic and Hisrisch, 2005; Barringer and Bluedorn, 1999; Covin and Miles, 1999; Ireland, Covin, and Kuratko, 2009; Kelley et al., 2009) and it must be part of the organizational culture (Antonic and Hisrisch, 2003; Barringer and Bluedorn, 1999; Dunklap-Hinkler et al., 2009; Garvin and Levesque, 2006; Kelley et al., 2009). An overview on the theories on the definition of Corporate Entrepreneurship is given in table 3.1

Table 3.1 shows that there are many recurring parts in different definitions of Corporate Entrepreneurship. This study adopt the definition as created by Covin and Miles (1999) because of their extended attention to prior research and towards different aspects of Corporate Entrepreneurship. The define Corporate Entrepreneurship as *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets, or industries in order to create or sustain competitive advantage"* (Covin and Miles, 1999). Their definition matches the desired state of the building industry as an innovative industry that focusses on the development and implementation of new products, markets, and production processes (de Bruijn and Maas, 2005; Nijhof et al., 2008).

A Corporate Entrepreneurial strategy

When organizations pursue an entrepreneurial attitude, their strategy should coincide with this pursuit. Covin and Miles (1999) describe four potential strategic approaches; (1) sustained regeneration in which the organization focusses on a new product or the entrance to a new market, (2) organizational rejuvenation, aimed at the improvement of the firm functioning and/or its strategy implementation. (3) Strategic renewal emphasizes on the creation of a new strategic direction. (4) Domain redefinition places the emphasize on the creation and exploitation of a new product/market arena.

"Changing an organizational culture take 5 to 10 years."
Interviewee on corporate culture

"If the people in charge are old fashioned, it is never going to work out"
Interviewee on Top management

The categorization of Covin and Miles (1999) is chosen in this study because it is also employed by scientists who evaluate the use of Corporate Entrepreneurship in Project Based industries (Fredriksen and Davies, 2008); a categories that also includes the building industry.

Organizational modes

When an existing organization embarks on the path of Corporate Entrepreneurship, it has to both continue its existing business while pursuing new opportunities at the same time. This balancing act of exploitation existing business while simultaneously exploring new opportunities is identified as one of the main issue in Corporate Entrepreneurship literature (Benner and Tushman, 2003; Birkenshaw and Gibson, 2004; Lavie, Stettner, and Tushman, 2010). This balancing act is referred to as ambidexterity.

There are four potential organizational modes that support this ambidexterity. Lavie, Stettner, and Tushman (2010) describe these as: (1) contextual ambidexterity; both activities are maintained simultaneously and nurtured in an appropriate organizational context. (2) Organizational separation; both activities are pursued on a different location. (3) Temporal separation; the two activities are performed in sequence. And (4) domain separation; both activities are pursued simultaneously but in different domains. Figure 3.3 depict these modes.

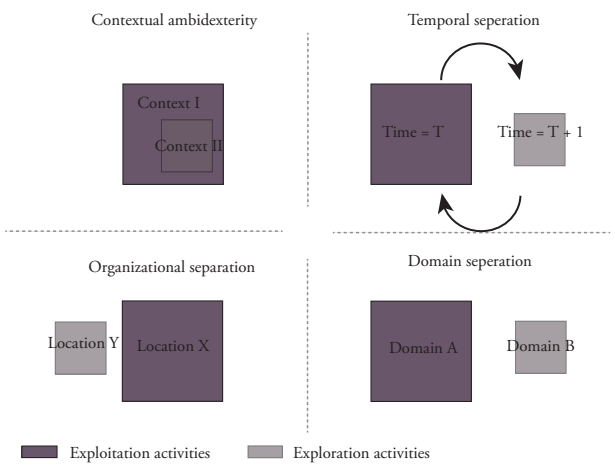


Figure 3.3 Organizational modes of Corporate Entrepreneurship

Learning from mature innovative industries

In order to see how Corporate Entrepreneurship might work in the building industry, it is instructive to research the application of Corporate Entrepreneurship in other industries. This will provide input in the difficulties and benefits that organizations encounter when implementing a Corporate Entrepreneurial strategy, culture, and structure in their business.

Demand and technological uncertainty

The focus on entrepreneurship varies greatly between industries. The uncertainty in the environment of the firm (both in demand and in technology) is an indicator of the importance of innovation and thus of Corporate Entrepreneurship (Barringer and Bluedorn, 1999; Garvin and Levesque, 2006; Ireland, Covin and Kuratko, 2009). The Harvard Business Review offers a framework that maps the uncertainty surrounding an industry, this framework is portrayed in figure 3.4.

The demand uncertainty of an industry arises from the uncertainty associated with customer preferences. The more unknowns there are in this area, the higher the 'demand uncertainty' score on the scale. Technological uncertainty result from unknown developments regarding technologies that might emerge or be combined with existing technology in order to create a new product or service. This framework offers insight in the uncertainty that an industry is facing and should accumulate on in its business model (Dyer, Furr, and Lefrandt, 2014).

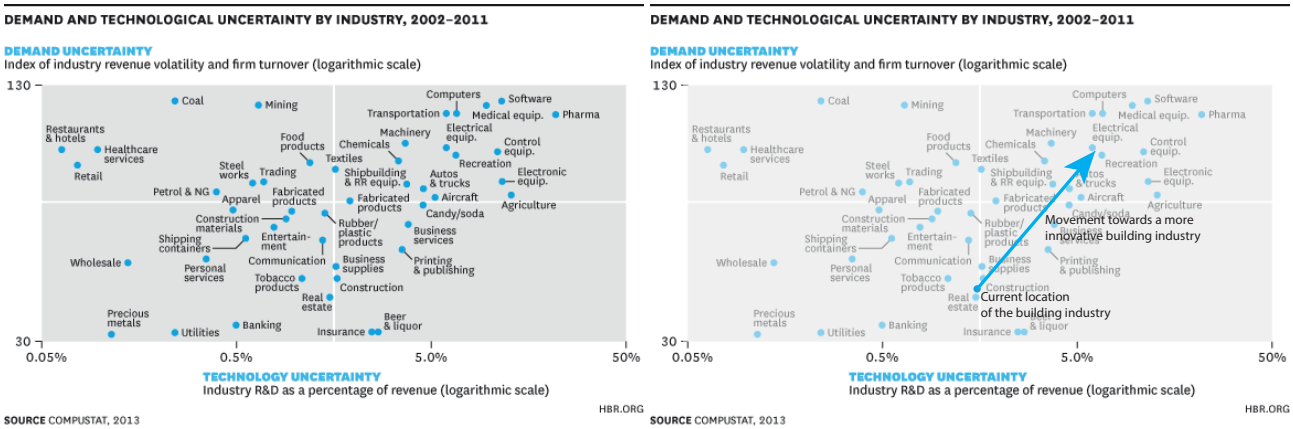


Figure 3.4 The Harvard Business Review uncertainty framework and the desired relocation of the building industry

When a company aims for innovative success, it is important to know were the industry is located on the framework. As can be seen in figure 3.4. companies that face a high level of uncertainty in both technological and demand characteristics, are more likely to embark onto an entrepreneurial vision. Companies such as IBM (computer), Google (software) and Shell Chemical (chemicals) have a high focus on Corporate Entrepreneurship (Dyer, Furr, Lefrandt, 2014; Kelley, Peters and O'Connor, 2009).

Industries related to the building industry (real estate and construction) both have a medium technology uncertainty and a low demand uncertainty. The growing demand for innovation in this industry (Davidson, 2013; Dulaimi, Ling, Ofori and De Silva, 2002; Hertog and Brouwer, 2001; Winch, 1998) shows that the industry should try to create a more competitive environment by trying to relocate itself in the desired quadrant of the framework; the upper-right. This movement would imply an increase in the Research and Development efforts of organizations. This increase has been pointed out as a sounds step towards a more innovative building industry (Dulaimi et al., 2002; Gambatese and Hollowell, 2011).

The Business Model Canvas

The changes in the amount of uncertainty that surrounds an organization has an effect on the organizational structure. This structure is mapped in the business model; a description of the completeness and the consistency of how a company creates, delivers, and retains value and the consequences it carriers for the internal organization (Arts and van der Pijl, 2010).

An often used management tool to depict the business model is the Business Model Canvas (figure 3.5). The canvas describes how an organization intents to maintain itself by showing the customer, the value proposition, the infrastructure, and the financial viability of the organization (Arts and van der Pijl, 2010).

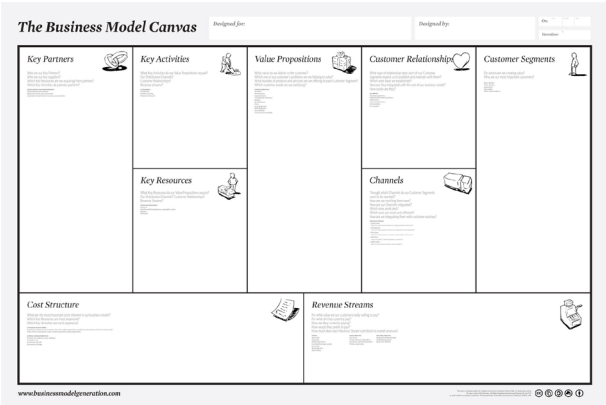


Figure 3.5 The Business Model Canvas

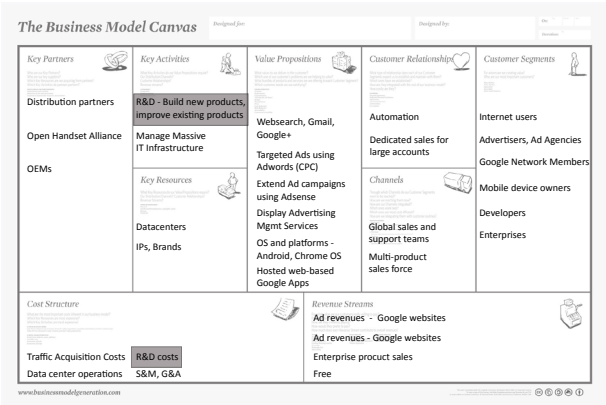


Figure 3.6 Google's Business Model Canvas

When changes in uncertainty surrounding an organization (both demand and technological) occur, more innovation is required, and the business model should be altered. An illustration of this is the Business Model Canvas of Google; an organization that has embedded innovation and change into its business model (Dyer, Furr, and Lefrandt, 2014; Kelley, Peters, and O'Connor, 2009).

Figure 3.6 depict Google's business model. In the canvas, the necessity for innovation is integrated in its key activities. Research and Development in part of their main activities and of their cost structure. This example demonstrates that the embedment of innovation in the business model is important when an organization wants to be innovative. This example is supported by scientific research that states that a business strategy and a business model aimed at innovation is essential for the successful implementation and exploitation of innovative opportunities (Hartmann, 2006; Sexton and Barrett, 2003).

The Uncertainty framework as well as the Business Model Canvas can be useful tools when looking at the improvement of innovation in the building industry by employing Corporate Entrepreneurship. The need for an innovative strategy and culture in the building industry is eminent (Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Kuratko, Ireland, and Hornsby, 2001; Ling, 2003; Sexton and Barrett, 2003) as well as the need to increase R&D activities to improve innovativeness (Blayse and Manley, 2004; Dulaimi et al., 2011).

In order to get an innovative strategy and culture, and an increase in R&D activities, these aspects should be embedded in the business model (Barringer and Bluedorn, 1999; Garvin and Levesque, 2006; Ireland, Covin, and Kuratko, 2009).

Characteristic and attributes of Corporate Entrepreneurship

A variety of factors that influence the organizational success in Corporate Entrepreneurship has been identified by scholars. This review will provide an overview of prior academic effort in this field. This overview will provide a theoretical framework that can be used in future research to model the organizational- and environmental variables that influence the possibilities of Corporate Entrepreneurship in the building industry. An overview of variables given by academia is given in figure 3.7.

Top management, cultural norms and employee involvement.

The support of top management is seen as critical for the implementation and success of a Corporate Entrepreneurial strategy within the organization (Ireland, Covin and Kuratko, 2009; Kuratko, Ireland and Hornsby, 2001; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013). The strength of the pro-entrepreneurial cognition of top management is positively related to the emergence of a strategic vision that focusses on Corporate Entrepreneurship (Ireland, Covin and Kuratko, 2009). Top management support for an entrepreneurial strategy will create an emphasize on strategic control that is essential for a successful entrepreneurial perspective (Barringer and Bluedorn, 1999).

The creation of an entrepreneurial vision is an important factor that influences a company's ability to be entrepreneurial (Kuratko, Ireland, and Hornsby, 2001). This vision is created by top management and indicates what a company expect to achieve. The vision should have several characteristics in order to make it successful within the organization; it should be (1) sensible in the eyes of the employees, (2) easily understood, (3) suggest a higher calling, and (4) create a cultural glue that binds people together and supports knowledge sharing.

An entrepreneurial strategy will result in a (partly) organic strategy, it will strengthen cultural norms favoring entrepreneurial behavior of organizational members, strengthen the entrepreneurial capabilities of the organization and help to implement a reward system that encourages entrepreneurial behavior (Ireland, Covin and Kuratko, 2009).

The creation of an organizational glue is important when establishing an entrepreneurial strategy into an organization. This cultural glue, also called organizational culture or cultural norms, will increase the probability that employees will seek and exploit

"We need to show courage, do things radically different."
Interviewee on the needed change

entrepreneurial opportunities. This probability also depends on the strength of organizational members' pro-entrepreneurial cognitions. The higher their entrepreneurial cognitions, the more strength cultural norms favoring entrepreneurial behavior have, and the larger the probability that employees seek and exploit entrepreneurial opportunities (Barringer and Bluedorn, 1999; Ireland, Covin and Kuratko, 2009). This employee involvement in the entrepreneurial strategy of the organization is also referred to as *"a deep locus of planning"* (Barringer and Bluedorn, 1999). When there is a deep locus of planning in the organization, employees will be more willing to contribute and navigate through the organization in order to gain knowledge. This organizational network capacity is important in the creation of new business opportunities (Kelley, Peters and O'Connor, 2009).

An encouraging rewards system is essential in the successful implementation of entrepreneurship in an organization (Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001). This rewards system should encourage risk taking behavior of employees in order to increase their willingness to accept the risks submissive to the pursuit of entrepreneurial opportunities (Kuratko, Ireland, and Hornsby, 2001).

When an organization has top management support, an entrepreneurial vision and strategy and the cultural norms to ensure employees involvement, the strength of the organizational competitive capabilities and the realization of the strategic positioning will result in a higher strength of the organizational entrepreneurial architecture as well as the intensity of competition, the rapidity of technological change and the extensiveness of the product-market domain (Ireland, Covin, and Kuratko, 2009).

Communication with the environment: the network importance

The involvement of top management and organizational employees are not sufficient in order to create a successful entrepreneurial organization. B.A. Barringer and A.C. Bluedorn (1999) state that the communication with the environment is essential when seeking successful entrepreneurial opportunities. This phenomenon is called scanning intensity; the managerial activity of learning about trends and events in the environment of the organization (Barringer and Bluedorn, 1999). Their view is supported by Kelley, Peters and O'Connor (2009) who state that the network capacity of the organization with other members in its environment is crucial for the successful pursuit of new business opportunities.

The environment of an organization determines the intensity of competition, the rapidity of technological change, and the extensiveness of the product-market domain (Ireland, Covin and Kuratko, 2009). These environmental factors in their turn determine the top management pro-entrepreneurial cognition, and this is, as seen at the start of this section, essential for the successful pursuit of an entrepreneurial organization (Ireland, Covin and Kuratko, 2009; Kuratko, Ireland and Hornsby, 2001; Martin-Rojas, Garcia-Morales and Bolivar-Ramos, 2013).

The different academic frameworks offered in existing literature show many similarities and are complementary to each other. The scientific most influential frameworks are provided in figure 3.7, with their categorization (by color). The figure shows the level of consensus between academia about the most important attributes when an organization is, or desires to be, entrepreneurial.

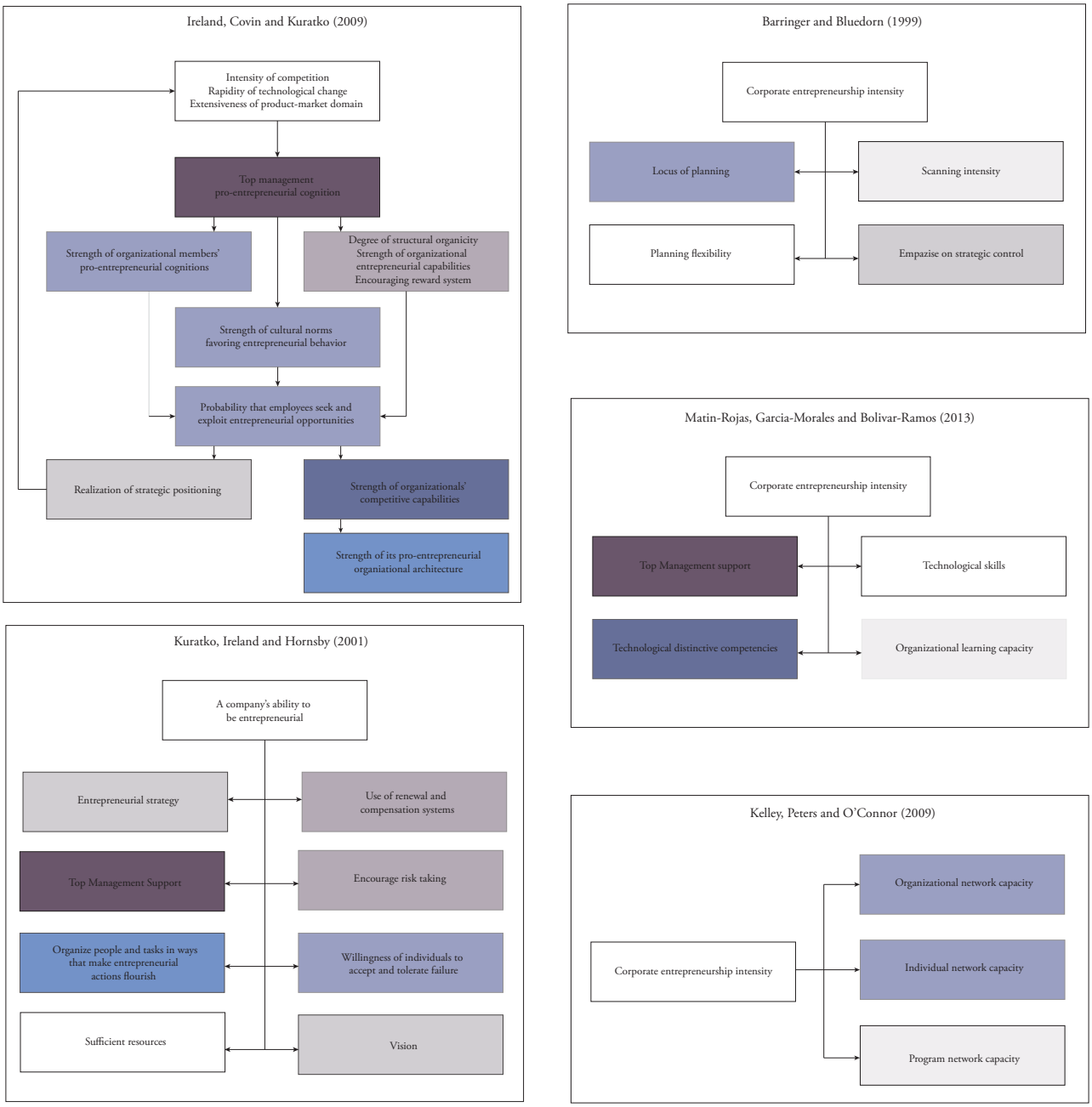


Figure 3.7 Attributes of Corporate Entrepreneurship provided by academia

This section shows that corporate entrepreneurship is an extensively researcher field of study that is often used to increase the innovativeness of an organization. Corporate entrepreneurship is *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets, or industries in order to create or sustain competitive superiority".*

Many organizational variables are important when using Corporate Entrepreneurship. These include; (1) the organizational culture, (2) the strategy, (3) top management support, (4) proper reward systems, and (5) the communication with the environment.

The idea of Corporate Entrepreneurship is already used in practice, and these examples show the possible benefits it could hold for the building industry. But in order for it to work, it has to adapt itself to the specific needs and characteristics of the industry.

3.4 Corporate Entrepreneurship in the building industry

Previously, this reviews has pointed out the issues regarding innovation in the building industry and its foundations. A concept from another field of study is introduced: Corporate Entrepreneurship. A corporate method that helps to increase the innovativeness of an organization implementing an entrepreneurial organizational structure.

This section focusses on the combination of innovation in the building industry and the possible usability of Corporate Entrepreneurship to solve this issue.

Project Based Firms

When connecting the problem of innovation in the building industry and the concept of Corporate Entrepreneurship, it is important to look at the industry characteristics. Prior research indicates that the building industry can be seen as project-based. And although literature on the implementation of Corporate Entrepreneurship in the building industry is concise, there has been more attention towards the implementation of Corporate Entrepreneurship in project based firms. Project based firms' delivers one-of-a-kind projects; a project involves non-repetitive, complex tasks. *"Projects are temporary organizations involving teams of individuals from within a single firm or from multiple firms. A project performs a time-sequenced set of interdependent activities to achieve pre-defined goals or conform to specifications. Projects are initiated to accomplish tasks that do not occur sufficiently often to warrant the establishment of an enduring organization".* (Frederiksen and Davies, 2008).

The description of Frederiksen and Davies (2008) is projectable on the building industry. Building is a non-repetitive, complex task where many different parties work together to create a one-of-a-kind product; all buildings differ from each other in size, function, location and/or user. The goal of a project in the building industry is predefined; the complete result is recorded in the construction specifications. This similarity between project based firms and the building industry is also noted by Satiawan, Erdogan and Ogunlana (2012), as well as Blayse and Manley (2004), and Blindenback-Driessen and van den Ende (2006) that subscribe the idea that both concepts make use of temporary projects within existing organization in order to deliver a unique end-product.

Attributes of Corporate Entrepreneurship and project-based firms

Blindenback-Driessen and van den Ende (2006) describe the influence that the project-based nature of an organization can have on its Corporate Entrepreneurship compatibility. They point out variables that are more important to take into account in the project based firms such as; top management support, application of contingent planning approaches, explicit project selection, and the availability of experts, making business cases, and testing and launching new services. They also point out several variables that are less important in project-based firms who want to implement Corporate Entrepreneurship; the use of cross-functional teams, collaboration with customers and suppliers, and a heavyweight project manager. A footnote that can be placed by the study of Blindenback-Driessen and van den Ende (2006) is that their results partly are conflicting with other studies about innovation in the building industry. Blindenback-Driessen and van den Ende (2006) find that client and supplier involvement is less important when establishing an innovative organization, while other research (from Blayse and Manley, 2004; Gambatese and Hallowell, 2011; Winch, 1998) indicated the opposite correlation. This difference can be explained by the limitations in the study of Blindenback-Driessen and van den Ende (2006) as pointed out in their discussion section. They only use a small sample size and leave out many other factors that might influence this variable.

The organizational form

It can be concluded that the building industry is a form of a project based firm. The similarities between the building industry and project based firms has its implications for the organizational forms in which Corporate Entrepreneurship will express itself in the building industry. A project should be *"understood as a novel entrepreneurial venture to create new markets encompassing new customers"* (Frederiksen and Davies, 2008). The project based firm can therefore be seen as an expression of Lavie et al. (2010) second form of Corporate Entrepreneurship; organizational separation (both activities are pursued on a different location). With project being the different locations in with both the activities (exploration and exploitation) are being performed (see section 3.3).

Employing Corporate Entrepreneurship in the building industry

There are several foundations for the statement that Corporate Entrepreneurship and the building industry are a beneficial combination.

The first foundation; the project based firm

Corporate Entrepreneurship has been identified has a viable means to create innovation in project-based firms (Blindenback-Driessen and van den Ende, 2006; Frederiksen and Davies, 2008). And as emphasized by many researchers in prior literature, organizations in the building industry are project-based firms (Blayse and Manley, 2004; Blindenback-Driessen and van den Ende, 2006; Satiawan, Erdogan and Ogunlana, 2012).

The second foundation; overlaps

Academics have pointed out several options to increase innovation in the building industry by altering the organizational structure (see section 3.2). These proposed alternations are shared with the characteristics of a Corporate Entrepreneurial organization; this compatibility is shown in table 3.2.

This means that there is great overlaps in the proposed organizational improvement for building organizations, provided by literature in the field of building, with the proposed organizational improvements made by academia in the field of Corporate Entrepreneurship. This overlaps indicates that the innovativeness in the building industry can be enhanced by implementing a Corporate Entrepreneurial organization structure.

Literature on building industry	Attribute	Literature on Corporate Entrepreneurship
Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Ling, 2003.	Organizational culture that supports innovation	Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001
Blayse and Manley, 2004; Hartmann, 2006; Ling, 2003; Sexton and Barrett, 2003	Organizational strategy that focusses on innovation	Barringer and Bluedorn, 1999; Covin and Miles, 1999; Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001
Blayse and Manley, 2004; Hartmann, 2006; Ling, 2003; Sexton and Barrett, 2003	Top management support	Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013
Gambatese and Hallowell, 2011; Hartmann, 2006; Winch, 1998	Organizational structure that supports innovation	Benner and Tushman, 2003; Birkenshaw and Gibson, 2004; Ireland, Covin and Kuratko, 2009; Kuratko, Ireland and Hornsby, 2001; Lavie t al., 2012

Table 3.2 Attributes that could enhance innovation in the building industry and are also listed as attributes that are part of a Corporate Entrepreneurial organization.

The third foundation; industry characteristics

The high competition in the building industry and its business risk character (Satiawan, Erdogan, and Ogunlana, 2012) are also characteristics that increase the beneficial potential of Corporate Entrepreneurship in the building industry. Corporate Entrepreneurship is a viable means to create competitive advantages by innovation (Antonic and Hirsch, 2003; Covin and Miles, 1999; Kuratko et al., 2001; Schumpeter, 1936) and can thus improve an organization's position in the market.

The compatibility of the building industry and Corporate Entrepreneurship is founded on three pillars. (1) The project based nature of the industry make it suitable for the use of Corporate Entrepreneurship; by using projects as vehicles for innovation. The second pillar (2) is the overlaps between literature on the improvement of innovativeness in the building industry and literature on Corporate Entrepreneurship. This overlaps shows that many problems and solutions that are found in the building industry can be solves/implemented by using Corporate Entrepreneurship. And the final pillar (3) is the high competition and business risk character of the building industry (Setiawan, Erdogan, and Ogunlana, 2012). This makes an increase in entrepreneurial character desirable for organizations since it enhances its competitiveness and flexibility.

These three foundations indicate that Corporate Entrepreneurship can be a viable mean to enhance to innovativeness of the building industry.

How to solve the problem

As seen previously, there has been a lot of prior research on improving innovativeness in an organization by implementing an entrepreneurial structure. This section provides insight in the research methods that academia use to define the success factors of the implementation of Corporate Entrepreneurship and evaluate its success.

The definition of prior used research methods creates a research framework that shows the road ahead when evaluating the implementation of Corporate Entrepreneurship in the building industry. This research framework should answer several question including;

- What variables and attributes create an entrepreneurial organization;
- What is the cohesion and weight of these different attributes?

The answers to these question provide insight in a research path that, when followed, shows how future research can investigate and provide clarity about the use of Corporate Entrepreneurship in the building industry.

What makes Corporate Entrepreneurship successful?

In order to evaluate the potential of Corporate Entrepreneurship in the building industry, it is important to locate and evaluate the different attributes that create a successful entrepreneurial organization. Their importance, or weight, as well as their interrelationships should be defined in order to create a theoretical model that shows how Corporate Entrepreneurship works in an organization.

"Open innovation sounds nice. But it doesn't work with an every-man-for-himself-attitude."

"You can work together to gain a whole pie, or fight each other over the crumbs."

"Innovation must be created together."

Several interviewees on the network importance

Attributes

The location and scoring of attributes that influences the organizational success in being entrepreneurial, is one of the key issues that need to be solved in order to learn more about how Corporate Entrepreneurship works in an organization. This issue is addressed by many academia. Amongst them are Antonic and Hisrich (2003); Barringer and Bluedorn (1999); Blindenback-Driessen and van den Ende (2006); Covin and Miles (1999); Gavin and Levesque (2006); Ireland, Covin, and Kuratko (2009); Kelley, Peters, and O'Connor (2008); Martin-Rojan, Garcia-Morales, and Bolivar-Ramos (2013); Walrave, Gilsing, and de Jager (2009). Their research approach is depicted in table 3.3.Evaluating prior research on attributes that influence the organizational success of Corporate Entrepreneurship shows a coherent approach. The first step is always a literature review. The second step consist of collecting data by using surveys and/or case studies.

Table 3.3 Research approach prior research on evaluating attributes of Corporate Entrepreneurship.

Source	Used research method(s)	Notes
Walrave, Gilsing, and de Jager (2009)	(1) Literature review	
	(2a) Case study; surveys to 79 participants of which 60 responded. (2b) Interviews with experts: innovation managers and top management	Researching the corporate culture of two companies; scoring of attributes by organizational members
Ireland, Covin, and Kuratko (2009)	(1) Literature review	
Covin, and Miles (1999)	(1) Literature review	
Antoncic and Hisrich (2003)	(1) Literature review	
	(2) Surveys among top managers	Representative and sizeable sample, no random sampling
	(3) Normative model	Structural equation modelling using EQS. Hypothesis testing
Kelley, Peters, and O'Connor (2008)	(1) Literature review	
	(2) Comparative case analysis using interviews	In leading companies
Garvin and Levesque (2006)	(1) Literature review	
	(2) Case study	Intensive study of IBM
Martin-Rojas, Garcia-Morales, and Bolivar-Ramos (2013)	(1) Literature review	
	(2) Surveys from top management	Using a 7 point scale to weight the attributes
	(3) Hierarchical regression model	To evaluate the answers from the survey
Barringer and Bluedorn (1999)	(1) Literature review	
	(2a) Self-report mail survey (2b) Database	
	(3) Pilot study	Top management used to assess validity and reliability.
Blindenback-Driessen and van den Ende (2006)	(1) Literature review	
	(2) In depth case studies	Six cases

The target group for the collection of data often consist out of top management or other experts in the field of organizational structure, innovation, and/or Corporate Entrepreneurship. These 'expert groups' help to identify and weight the attributes. A list of attributes is provided by the literature review (step one), and is adjusted and scored in the second step.

A survey approach when working with groups of experts is the Fuzzy Delphi Method (FDM). FDM is a research method that uses collective decision-making to establish weights to attributes. There are several rounds of anonymous questionnaire surveys that ask experts for their opinion. The purpose of the method is to provide a consensus between experts (Ho and Wang, 2008). The FDM uses a fuzzy numbers scale in order to evaluate the agreement degree between experts. This results in a consensus coefficient that can be used to diminish the overall fuzziness of the surveys.

FDM is founded on group thinking of qualified experts that assures the validity of collected information. The method has several benefits when compared to its predecessor, the Delphi method. Is saves survey time, the costs are lower, the number of surveys is reduced while the recovery rate of surveys is increased, experts can fully express their opinion and ensure the consistency and completeness of the group opinion, and this methods takes into account the fuzziness that cannot be avoided during the survey process. The results of this method is a true reflection of the experts' opinion (Glumac, 2007; Ho and Wang, 2008).

This research method is therefore a suitable method to establish a complete list of attributes that influence the success of Corporate Entrepreneurship and their ranking. The use of experts is very useful when reviewing Corporate Entrepreneurship in the building industry, since there is no prior research on its attributes; experts can provide insight in the specific character of the industry and therefore create a weighted attribute list that fits it unique character.

"Learning from the mistakes and failure in one project, as well as seizing arising opportunities, is rare"

An interviewee's perspective on the project based nature of the industry and innovation

An addition from practice: interviews

This literature review describes the theoretical link between the building industry and the concept of Corporate Entrepreneurship. In order to validate and increase the value of this theoretical work, three in-depth interviews are constructed with innovation and building professionals. These interviews evaluate the theory in regard to the Dutch situation and are the first test to establish the validity and applicability of this theoretical work.

The goal the interview is to see if and how theory and practice are connected, how they overlaps, and how they complement each other. In order to reach this goal, respondents should be able to give their own opinion, without being influences by this theoretical work and its implications. Therefore, the respondents do not receive theory on the subject beforehand, and questions are kept very open and are solely mend to guide the interview around certain topics.

The interview protocol in given in Appendix D. Each interview was recorded. These recordings are documented in Appendix E, these recording are salient (simplified view of the actual conversation). The interviews were held in Dutch, since this is the native language of all respondents.

Qualitative data matrix

This interview method inherently creates a wide range of answers. Therefore, comparing the interviews requires a method that structures this unstructured data into one overview.

The qualitative data matrix is developed by Bijlsma-Frankema and Drooglever Fortuijn in 1997 as a method to structure unstructured data as gained by expert interviews. In this matrix, the columns represent the respondents and the rows represents the topics discussed in the interview. Each cell is filled with the opinion of the respondent on a certain topic (Bijlsma and Bunt, van de, 2000). The resulting matrix is a map of the opinions of experts on a topic.

The map of opinions of experts on the issue of innovation in the building industry in regard to Corporate Entrepreneurship is given in Appendix E. Table 3.4 combines the quantitative data matrix and the theory as provided in this study.

Table 3.5 shows that the perception of respondents in regard to (1) the increase of innovation in the building industry, as well as (2) the barriers to innovation, have a great overlaps with the theory as derived from the scientific literature; they often mention some incentives and barriers. These similarities indicate that this theoretical work has a practical value and that the subject of this investigation is relevant not only by its added value to current scientific work, but also in regard to the practical application of Corporate Entrepreneurship in the building industry.

3.5 Conclusion and discussion

Theoretical framework

This section shows that Corporate Entrepreneurship and the building industry can be a potential match in the creation of innovation. For a successful symbioses of the two, a theoretical framework is required that describes the attributes that are part of a successful Corporate Entrepreneurial system in the building industry.

Previously, the concept of Corporate Entrepreneurship is describes as "the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority" (Covin and Miles, 1999) and the mode of Corporate Entrepreneurship most fit for the

Table 3.4 The respondents and the theory

Attribute	Respondent A	Respondent B	Respondent C
Barriers of innovation – from literature			
Market structure	Δ	Δ	Δ
Fragmented industry	●	Δ	Δ
Client has dominant role in the project	Δ	Δ	Δ
Lack of co-ordination between academia and industry	●	●	●
Economic conditions	Δ	Δ	Δ
Cost of research	Δ	Δ	Δ
Restrictions by regulations	Δ	Δ	Δ
Form of contract	Δ	Δ	Δ
Lack of investment in R&D	●	●	Δ
Industry has low perceived innovation-drive level	Δ	Δ	Δ
Lack of promotion, recognition, and rewards of creativity, quality of work, and innovation	Δ	Δ	Δ
Project Based Character	Δ	Δ	Δ
Barrier of innovation – added*			
Large companies are cumbersome	Δ	●	●
Strong focus on financial incentives	Δ	Δ	Δ
Strong competition	●	Δ	Δ
Increasing innovation – from literature			
The role of the client	Δ	Δ	Δ
Organizational structure that supports innovation	Δ	Δ	Δ
Use project as vehicles for innovation	Δ	Δ	Δ
R&D activities	Δ	Δ	Δ
Promotion and enabling of greater integration in the value chain.	Δ	Δ	Δ
Increasing innovation – added*			
Product and service development	Δ	Δ	Δ
New responsibilities	Δ	Δ	Δ
Attracting innovative ideas from outside the organization	Δ	Δ	Δ
More focus on disruptive innovations	●	Δ	●
Ownership of products (circular economy)	●	Δ	●
Innovation as a societal challenge	●	●	Δ
Creating one innovation agenda for the entire branch	●	●	Δ
Corporate Entrepreneurship – from literature			
Top Management Support	Δ	Δ	Δ
Cultural norms	Δ	Δ	Δ
Organizational members entrepreneurial cognition	Δ	Δ	Δ
Organizational support for entrepreneurial behavior	Δ	Δ	Δ
Provision of resources	Δ	Δ	Δ
Availability of experts	●	Δ	Δ
Encourage risk taking	●	Δ	●
Reward system	Δ	Δ	Δ
Entrepreneurial vision	Δ	Δ	Δ
Entrepreneurial strategy	Δ	Δ	Δ
Scanning intensity	Δ	Δ	Δ
Network capacity	Δ	Δ	Δ
Employees perform entrepreneurial activities	Δ	Δ	Δ
Corporate Entrepreneurship – added*			
Corporate pride	Δ	Δ	●
Loyalty of employees towards the organization	●	Δ	●
Attract young, new people	Δ	Δ	Δ
Selling a 'why' not a 'what'	●	●	Δ

* Added; attributes that are mentioned by the respondent(s) that did not arise in the literature review.

Δ Mentioned by respondent ● Not mentioned by respondent

building industry is organizational separation (Lavie et al., 2010). A project should be understood as "a novel entrepreneurial venture to create new markets encompassing new customers" (Frederiksen and Davies, 2008).

With these basic elements in place, it is important to look into the attributes that influence the success and usability of Corporate Entrepreneurship in the building industry. These attributes should both describe the general agreed variables of Corporate Entrepreneurship as well as the specific attributes that describe the specific nature of the building industry.

A theoretical model of Corporate Entrepreneurship in the building industry should incorporate several sub-systems:

Subsystem 1: Attributes that influence the successful integration of Corporate Entrepreneurship in an organization.

Subsystem 2: Attributes that decrease the innovativeness of the building industry;

Subsystem 3: Attributes that will increase the innovativeness of the building industry;

Subsystem 4: Attributes that influence the success of Corporate Entrepreneurship in Project Based Firms.

These subsystems will provide an overview of the potential use of Corporate Entrepreneurship in the building industry. The subsystems are depicted in Appendix C.

The subsystems consist of attributes. All attributes have either a negative effect on the innovativeness of the organization, or a positive effect. For example: the multi participant character of a project has a negative effect on the innovativeness of an organization (Gumilar, Zarnic, and Selih, 2011) while top management support has a positive effect on the innovativeness of an organization (Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013). An overview of all attributes is given in Appendix B.

Together, all these attributes make up the four subsystems that together create the theoretical framework for the implementation and use of Corporate Entrepreneurship in the building industry. This framework is depicted in figure 3.8.

Discussion

This literature review is the foundation of further research on the use of Corporate Entrepreneurship in the building industry. It looks into the problems surrounding innovation in the building industry and its possible solutions. The concept of Corporate Entrepreneurship is introduced and matched to the building industry as a Project Based industry.

The review shows that the combination of the concept Corporate Entrepreneurship and the building industry may be a viable method to increase innovation in the building industry. There is a very limited amount of prior research on this topic, but several academia indicate that the combination may be beneficial (Satiawan et al., 2012).

It is important to note that this literature has several limitations and boundaries that need to be addressed and taken into account when reading and using this review. These point of discussion will be addressed in this section.

Boundaries

Every research has its boundaries. This predefined set of limitations has been made up at the start of this review. Without these boundaries, the research could go on and on. They are necessary to make the review a confined and relevant study. But they may also result in a limited scope, where certain information and side tracks are left out.

Global equality?

The subject of this research is a field of study that is not thoughtfully investigated before. Due to this, there is a limited amount of prior literature available. This means that studies are used that are executed in different parts of the world, in different cultures and economies. Although there are many similarities between different countries, localities can have their influence on the result of a study.

For example; one can imagine that the attribute 'laws and regulations' varies greatly amongst regions. When using the theoretical framework, the locality of attributes should be taken into account, and adjusted to local customs and values.

Fields of study

This review is an attempt to bring together different field of study. The fields of 'innovation in the building industry' and 'Corporate Entrepreneurship' are previously investigated separately and are rarely put together. This lack of prior research on the connection between these concepts makes this literature review a conceptual research that needs further investigation necessary.

Definitions

A limitation to the theoretical framework as provided in this review is the definition of variables. Many of the attributes that influence the success of Corporate Entrepreneurship in the building industry are difficult to define precisely and in a way that sets clear boundaries of what is, and what is not, part of the definition. This makes the interpretation of the model very subjective. This is a limitation that research has not yet solved; defining these attributes is a consistent way that everyone agrees upon is one of the challenges in this field of study.

Implications of this study

The positive effect of creating an entrepreneurial organization on innovativeness is undisputed, and so is the necessity to increase innovation in the building industry. This literature review is one step forward to a better understanding of the use of Corporate Entrepreneurship in the building industry. This study shows that there is a potential beneficial connection between the two; the connection is shown in the theoretical framework. This framework shows the environmental and organizational attributes that influence the innovativeness of an organization in the building industry.

This research has made a new step in the study of the use of Corporate Entrepreneurship in the building industry. This theoretical work is the foundation for future research that needs to validate its findings in practice. The validation of the theoretical framework here created is the road to a better understanding of Corporate Entrepreneurship in the building industry.

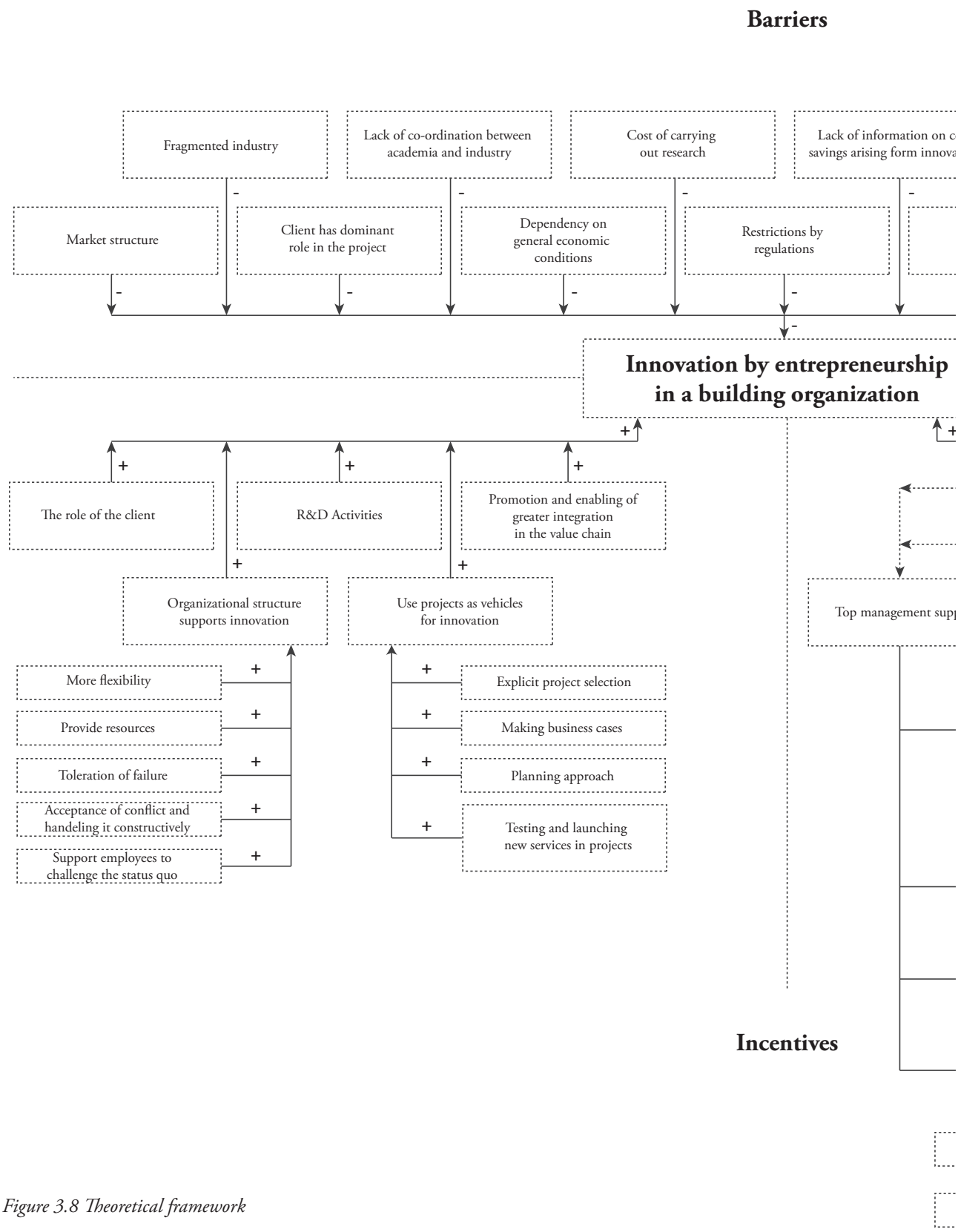
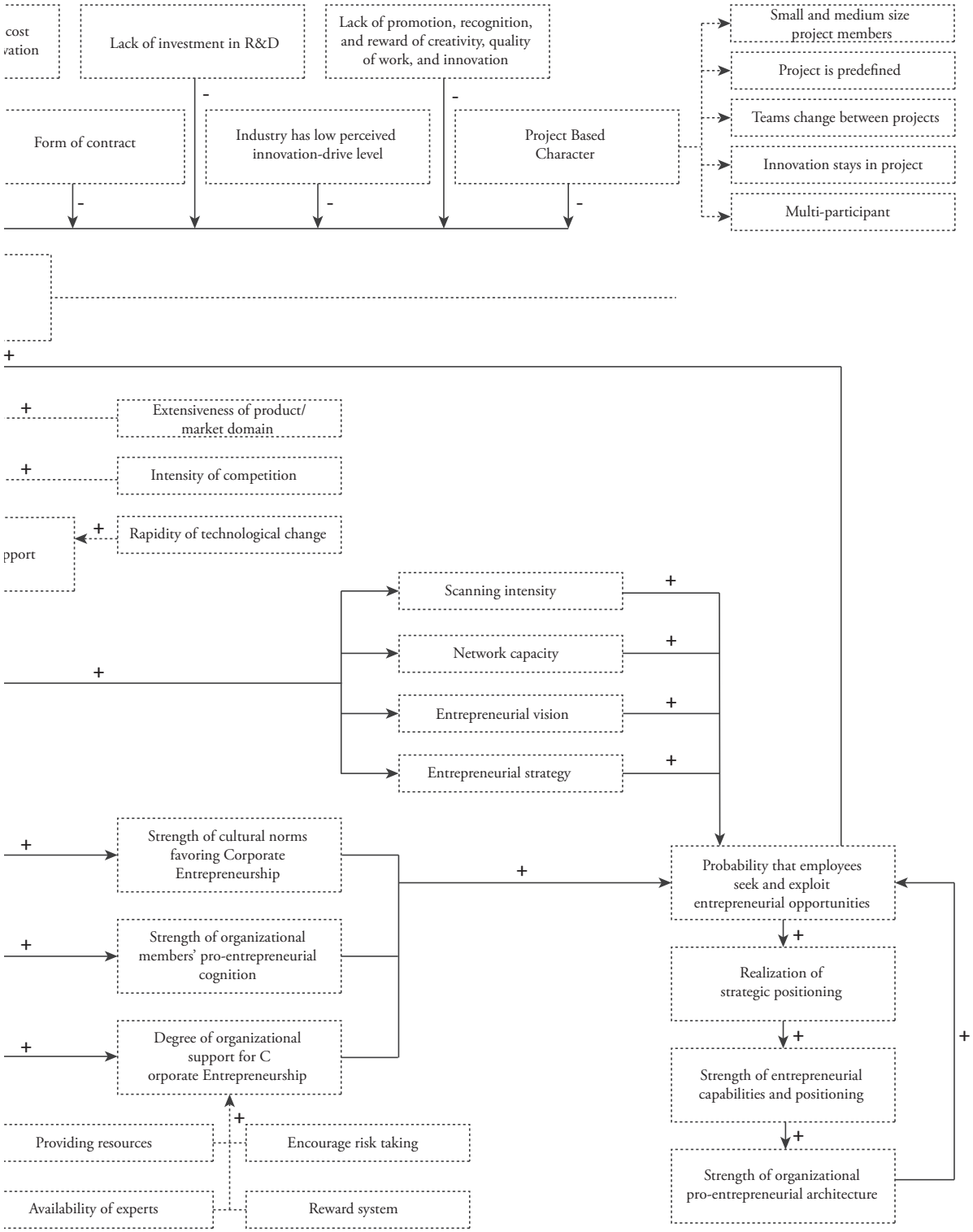


Figure 3.8 Theoretical framework


cost
vation
Lack of investment in R&D
Lack of promotion, recognition, and reward of creativity, quality of work, and innovation
Small and medium size project members
Project is predefined
Teams change between projects
Innovation stays in project
Multi-participant
Form of contract
Industry has low perceived innovation-drive level
Project Based Character
Extensiveness of product/ market domain
Intensity of competition
Rapidity of technological change
pport
Scanning intensity
Network capacity
Entrepreneurial vision
Entrepreneurial strategy
Strength of cultural norms favoring Corporate Entrepreneurship
Strength of organizational members' pro-entrepreneurial cognition
Degree of organizational support for C orporate Entrepreneurship
Probability that employees seek and exploit entrepreneurial opportunities
Realization of strategic positioning
Strength of entrepreneurial capabilities and positioning
Strength of organizational pro-entrepreneurial architecture
Providing resources
Encourage risk taking
Availability of experts
Reward system

4. Corporate Entrepreneurship in the building industry: a Fuzzy Delphi study

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Abstract

Increasing the innovativeness of the building industry is an important challenge. A concept that could contribute to innovative enhancement is 'Corporate Entrepreneurship'; a way to develop an entrepreneurial and innovative spirit throughout an organization and use this to gain innovative strength. Exploratory research indicates that this concept could be beneficial for the building industry and that it would work well with the industry characteristics. A theoretical framework is available that shows which organizational attributes are essential for the stimulation of Corporate Entrepreneurship, and thus of the innovative power of an organization. The validation of this framework is the done by employing the Fuzzy Delphi Method. The evaluation of these attributes is done by searching consensus amongst experts of two panels; innovation managers and top managers. In conclusion, this study shows that the most important attributes for building organizations in the Netherlands are: (1) top management support, (2) the provision of resources to perform entrepreneurial and innovative activities, and (3) using projects as vehicles for innovation.

Keywords: Corporate Entrepreneurship, the building industry, Fuzzy Delphi method, innovation, attribute framework, project-based industry.

4.1 Introduction: the problem

The Dutch building industry has a lack of innovative power (de Bruijn and Maas, 2005). This problem is an international one and many reports and scientists have discussed the nature and cause of it (Construct for excellence report, 2001; Dulaimi et al., 2002; the Egan Report, 1998). According to literature, the main reasons for the lack of innovation in the building industry are (1) its market structure (de Bruijn and Maas, 2005), (2) the fragmented nature of the industry (Davidson, 2013; Dulaimi et al., 2002; Miozzo and Dewick, 2005; Winch, 1998), (3) the lack of investment in R&D (Blayse and Manley, 2004; Dulaimi et al. 2002; Winch, 1998), and (4) the used reward systems (de Bruijn and Maas, 2005; Winch, 1998).

There is a general agreement that the increase of innovativeness of the building industry is an important issue (Blayse and Manley, 2004; de Bruijn and Maas, 2005; Miozzo and Dewick, 2004; Nijhof, Karssing, and de Bruijn; 2008; Winch; 1998). Prior literature distinguishes three categories that would benefit from more innovation. (1) The organization itself will gain more competitive advantage and is thus able to expand its market reach and increase its profitability (Davidson, 2013; Seaden, Guolla, Doutriaux, and Nash; 2003). Companies that are more innovative grow faster than their competitors (de Bruijn and Maas, 2005). (2) A more innovative building industry is a wealthier one. The size and wellbeing of the industry is essential for the general economy of a nation. The building industry account for about 15% to the national product, and its sound functioning is thus of importance to the entire economy. The third (3) level that benefits from a more innovative building industry is the consumer of the end-products. The current lack of innovation have led to a relatively high cost for housing when compared to other goods and services (Winch, 1998). A more innovative building

industry will lead to an improvement is price and quality of their products and processes, a benefit for all its users (Nijhof, Karssing, Wirtz, and de Bruijn, 2008).

A road to improvement: the objective of this study

Corporate Entrepreneurship is defined as *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority"* (Covin and Miles, 1999). It is a method to systematically enhance and stimulate an entrepreneurial attitude throughout an existing organization and use this entrepreneurial spirit to increase innovative performance.

This research is based upon the literature review *'Corporate Entrepreneurship in the building industry: a Literature review'.* This literature review is performed as the foundation of this study, and in the scope of the same graduation research. The review shows the possible usefulness of the Corporate Entrepreneurship concept for the building industry and its desire to be more innovative. The review ends with a theoretical framework that is founded on scientific research in both the field of Corporate Entrepreneurship as well as the building industry and innovation in the building industry. This theoretical framework is given in figure 4.1.

This framework shows the most important attributes when it comes to innovation in the building industry. It is split up in three part, briefly explained below, and more elaborated in the literature review.

Part one: barriers to innovation. This part identifies attributes that hinder innovation in the Dutch building industry. Examples of attributes in this part are: a lack of investment in R&D, the fragmented nature of the industry, and the project based nature of the Dutch building industry.

"The building industry has a very important role to play, and could be very innovative. But instead it behaves traditional and conservative."

Interviewee on the building industry

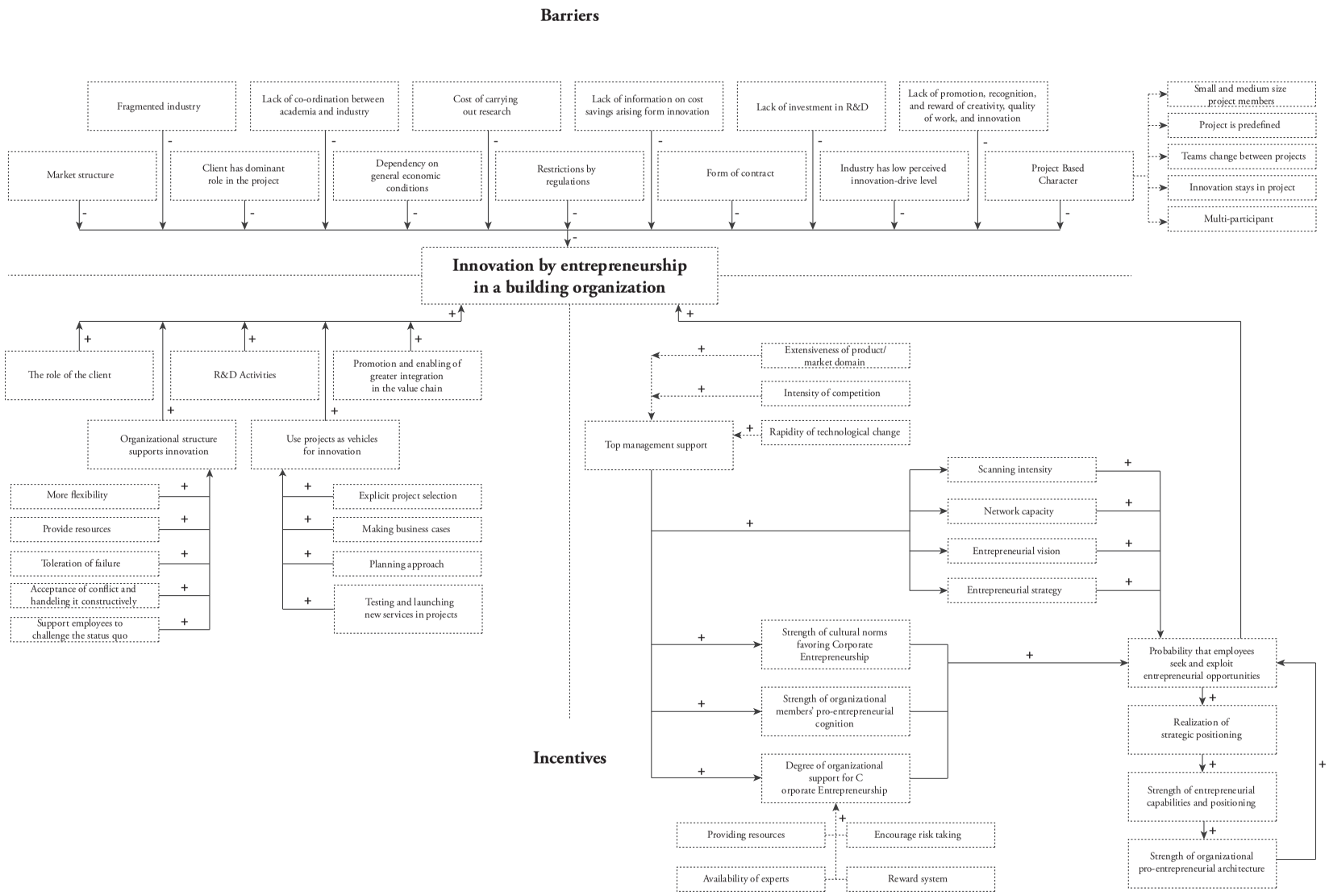

Figure 4.1 The theoretical framework on Corporate Entrepreneurship in the building industry.

Part two: incentives by Corporate Entrepreneurship. These attributes describe the application of the Corporate Entrepreneurship concept. Attributes include: top management support, an entrepreneurial vision, providing resources, and stimulating risk taking and acceptance of failure.

Part three: general incentives. These are attributes that represent incentives to innovation described by literature that do not strictly belong to the Corporate Entrepreneurship concept, but who might turn out to be important in the building industry. This includes attributes such as: use projects as vehicles for innovation, improvement of R&D activities, and the role of the client.

The literature review ends with the remark that Corporate Entrepreneurship potentially has a lot to offer to organization within the building industry. Since this theoretical framework is mainly based on scientific research on Corporate Entrepreneurship in other industries than the building industry, the importance to validate this theoretical model is the objective of this study. In short, the objective of this study is: *'a validation of the theoretical model on Corporate Entrepreneurship in the building industry'.*

Since this theoretical framework is mainly based on scientific research on Corporate Entrepreneurship in other industries than the building industry, the importance to validate this theoretical model is the objective of this study. In short, the objective of this study is: *'a validation of the theoretical model on Corporate Entrepreneurship in the building industry'.*

Method

This objective will be reached by employing the Fuzzy Delphi method; a research approach that is used to locate and weigh attributes. This study will validate whether the attributes in the theoretical framework are the attributes that contribute to entrepreneurial innovation in the building industry. It will also make it possible to rank these attributes for their importance.

Relevant scholarship

There is very little prior research in this field of study. Some have indicated that Corporate Entrepreneurship has a potential value to the building industry (Abdul-Rashid et al., 2010; Setiawan et al., 2012; Zain and Hassan, 2007). But the explanation of how this could

work, and how value can be added is non-existent. Therefore, this research will look into different fields of study that have researched a similar theoretical model with similar methods.

Expected results

The expected result of this study is a ranking and weighting of attributes contributing to innovation in a building organization as well as providing an overview of the most influential reasons behind the current lack of innovation in the industry. It shows which attributes are most important and which are less important when incorporating Corporate Entrepreneurship in a building organization. This ranking is basic information for firms when they want to embark upon their entrepreneurial journey.

4.2 In search of a method: experts and the Fuzzy Delphi approach

In order to reach the objective of this study; *'a validation of the theoretical model on Corporate Entrepreneurship in the building industry',* a research approach must be identified that is capable of doing so. Prior research on the use of Corporate Entrepreneurship often uses the knowledge of experts to identify, validate, and investigate attributes. Examples of this are studies performed by i.e. Antoncic and Hisrisch (2003), Barringer and Bluedorn (1999), Kelley, Peters, and O'Connor (2008), Martin-Rojas, Garcia-Morales, and Bolivar-Ramos (2013) and Walrave, Gilsing, and de Jager (2009). Therefore, this study will also employ a research method that uses the opinion of experts.

The Delphi method

In the '50 and '60 of the last century, a method for evaluating the opinions of experts was created by Dalkey and Helmer (1963). The objective of this method was *"to obtain the most reliable consensus of opinion of a group of experts"*. The opinions of experts are used to gain a *"consensus of informed opinion by soliciting the views of experts in the specific field"* (Philips, 2000). The Delphi method is a forecasting method that uses a repetition of questionnaires. Each new questionnaire is accompanied by an anonymous summary of the experts' opinions from the previous round. With this summary, the expert is encouraged to revise his earlier answer in light of the responses from other experts. Making the answers anonymous is an important aspect; it helps to prevent that certain, more influential or well know experts, influence all the others. The Delphi method presumes that the range of answers will decrease after each round and that the groups will converge towards a general consensus that expresses the most correct answer.

This process of questionnaires is repeated until a pre-determined number of round is finished, or when a predefined criteria is reached. Often, the sequence stops when respondents accept their final response, and have taken the opinions of other experts into consideration (Cheng and Lin, 2002). The method is very useful in decision-making situation where there are powerful personalities, group pressure, and status involved. A distinction between the Delphi method and other methods that use the opinion of experts, is that is does not involve bringing all experts together in person. This makes it a less expensive and difficult method to employ (Turoff 1970; Chang et al., 2000).

Fuzziness: an improved Delphi

One of the weaknesses of the Delphi method is that it requires many repetition of surveys, in order to allow the forecast values to converge. This makes it a very costly method, since it requires a lot of time from both the respondents as the researcher. Another results of the many repetitions is that the response rate gets lower each round (Ishikawa et al., 1993).

The many repetitions necessary in the Delphi method is due to 'fuzziness'. In the Delphi method, there is a 'fuzziness' or vagueness resulting from the lack of definite or sharp distinctions; answers and questions have the tendency to be indistinct. (Glumac, 2012; Seissing, Trillas, Moraga, and Termini, 2013). A

method of dealing with the 'fuzziness' of opinions, is the Fuzzy set theory, developed by Zadeh and Klauna in 1965. This methodology is used in domains where information is incomplete or imprecise, which is the case when evaluating opinions.

The Fuzzy Delphi method (or FDM) is a sub-method created from a combination of the Delphi Method and the fuzzy set theory. The FDM method was first proposed by Murray, Pipino, and Gigch (1985). Noordenhaven (1995) indicates that using FDM helps to solve the problem of fuzziness of common understanding of expert opinion. The basics of FDM created by Murray et al. (1985) was elaborated by Ishikawa et al. in 1993. In their research, a max-min criterion is used in combination with fuzzy scoring and cumulative frequency distribution to accumulate the expert's opinions into fuzzy numbers. This creates an expert prediction interval value that helps to derive the fuzzy numbers (Glumac, 2012). The creation of this expert's prediction interval value saves time and energy by reducing the number of questionnaires necessary.

The FDM is a method based on expert judgement, and has the following properties (Ho and Wang, 2008):

1. Anonymity. The involved experts do not meet each other and don't know how many other experts are involved. This encourages objectivity and prevents experts from being influenced by each other.
2. Feedback. The feedback of the survey gives participants insight in the opinions of the group; they receive information with which they can rethink their first opinion and alter it if desired.
3. Statistical. The opinions are processed statistically. The consensus is described in the majority (50% of the experts) with a bottom quarter and a top quarter (each 25% of experts).
4. Convergence. The feedback system makes the final results converge.

The expected result of this study is a ranking and weighting of attributes contributing to innovation in a building organization as well as providing an overview of the most influential reasons behind the current lack of innovation in the industry. It shows which attributes are most important and which are less important when incorporating Corporate Entrepreneurship in a building organization.

The FDM has several weaknesses that are inherent to the research method. The repeated survey makes it very time consuming, this repetition also increases cost of the research. The cooperation of experts is required, and a sufficient response rate is necessary; this increases the difficulty of coordination and communication. At a certain point in the analytical process, consensus of the experts' opinion is reached. The fuzziness of this part is not taken into consideration, which makes it easier to misinterpret the expert's opinion. And finally, during the analytical process, some opinions are suppressed in order to make the final result statistically correct (extremely different opinions are cut out) (Ho and Wang, 2008).

More information about the FDM, and its prior literature, can be found in the Glossary.

FDM is often employed in studies where current scientific research is limited (Ho and Wang, 2008) and it has proven its success in the validation of attributes (Chang, Huang, and Lin, 2000). This makes it a suitable match for this study where the objective is the validation of attributes from a theoretical framework on a topic that has almost no available prior literature (see the Literature review).

Methodology

There are many different methodologies in FDM. The most calculation deviations are about the calculation of the convergence of opinions. These calculations can be very extensive, or quite simple. Extensive mathematics is employed when the purpose of the study is to find the best method to represent the complete range of opinions into one number; it is a mathematical and scientific exercise. However, the aim of this study is not to find the best mathematical way to represent the range of answers, but to apply weight to attributes abstracted from literature. This is very often the research goal in FDM and this type of research uses a simpler method to calculate consensus and weight of attributes; the triangular membership function, as employed by Glumac (2012).

The methodological steps of this method are given below, a simplified flowchart of these steps is provided in table 4.1.

(1) Validate the predefined list of attributes. The first questionnaire is used to get a complete list of relevant attributes. Participants are asked to evaluate the attributes, and if necessary add new and subtract irrelevant attributes from the attribute list. For example: 90 percent of respondents value the attribute 'top management support' as valid, this means that it will be used in the next round.

(2) Collect the opinion of expert groups. The second round of questionnaire is used to determine the score of each attribute, validated in questionnaire one, on a scale of 0 to 10. This study uses a triangular approach all attributes are scored on their (a) minimum value, their (b) optimum value, and (c), their maximum value. For example an expert values the effect of the attribute 'top management support' with a minimum of 3, an optimum of 7, and a maximum of 8. This collection of 3 weights (3, 7, and 8) provides more information about the respondent and make the data collection more reliable.

(3) Set up overall trapezoidal fuzzy numbers. In this step, both the individual opinion of experts as the overall trapezoidal fuzzy number of an attribute are calculated (Glumac, 2012). The calculation of the evaluation of a single attribute by a single expert is expressed by the trapezoidal fuzzy number
$W_{ij}= (a_{ij} + b_{ij} + c_{ij})$. The overall value of an attribute is calculated by using the general mean model and is $W_j= (a_j + b_j + c_j)$ where:

$a_j = \min_f \{a_{ij}\}$' and

$b_j = (1/_n)\sum_{i=1}^{n} b_{ij}$ and (Chen, 2014).

$c_j = \min_f \{c_{ij}\}_{i=1}^{n}$

(4) Defuzzification. This step is about turning the overall trapezoidal numbers into a single real number. The single real number is derived by using the centre of gravity method (Glumac, 2012) for fuzzy number W_j of each attribute to define value S_j where j = 1,2,..,m. In order to enhance the optimal value (b) of an attribute, this study weighs this value heavier that the minimum (a) and maximum (c). The real number S_j, also named the crisp value, can be expressed as:

$$Sj = \frac{a_j+4b_j+c_j}{6}$$

(5) Screen evaluation indexes. When the numerous features are expressed as real numbers S_j, a delineation of the features is achieved by setting a threshold. For example, when using a scale of 0 to 10 in the surveys, the threshold α can, for example, be set at 6,00.
The principle follows:

If $S_j \geq \alpha$, attribute j is very important
If $S_j \leq \alpha$, attribute j is less important

These threshold values are used to obtain relative same values amongst different experts groups, and thus making them more comparable. And obtaining the most important attributes is important to make it manageable for modelling.

Table 4.1 Explanation of the methodology of FDM (with example)

Step	1	2	3	4	5
Name	Validate the predefined list of attributes	Collect opinions	Set up overall trapezoidal fuzzy numbers	Defuzzification	Screen the crisp value S_j
Question to answer (example)	What is the effect of top management support on innovation in the building industry? a. Positive b. Zero c. Negative d. Not applicable	What is the minimum, optimum, and maximum effect of top management support on innovation in the building industry?	What is the fuzzy number value W_{ij} for the attribute 'top management support'?	What is the crisp value of the attribute 'top management support'?	What is the threshold value, and does S_j reach it? $S_j \geq 0.5$ retain attribute $S_j < 0.5$ retain attribute
Answer (example)	a	Min = 3 Opt = 7 Max = 8	W_{ij} (0.3;0.7;0.8)	S_j = (0.3+(4*0.7)+0.8)/6 = 0.65	0.65 > 0.5 -> retain attribute.

Participant selection

The FDM uses expert opinions in order to gain insight in the validity and weight of attributes (in methodological step one and two, see above). The number of participants is limited, and their selection is therefore an important process in order to get valid and complete results. An expert panel usually exist of about 10 to 15 experts (Glumac, 2012). These panels should be as homogeneous as possible.

Adler and Ziglio (1996) propose four requirements that an expert has to meet: (1) knowledge and (2) experience on the topic, (3) sufficient time to participate, and (4) effective communication skills. A relevant panel exists of experts from various disciplines and work in different organizations (Delbecq, Ven, van de & Gustafson, 1975). The involved experts must be able to provide a sensible judgement about causes and effect of attributes (Tarawneh & Sarireh, 2013). In this study, different expert panels are constructed in order to find a broad perspective on the issue.

The first panel will be existed of people in top management positions. In Corporate Entrepreneurship literature, this group is described as one of the most important factors when it comes to the use and success of Corporate Entrepreneurship (Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013). A second panels will consist of experts of innovation in the building industry. This might be innovation managers or innovation consultants that advice and direct the innovation focus of a building organization. Some of the experts requested an anonymous representation of their responses. Therefore, names of persons and companies are processed anonymous.

The selection of experts for this study is done under consultancy of Bouwend Nederland. This is a branch organization that has 4300 members in the Dutch building industry. They offered their network connection with people involved in innovation and the improvement of innovation in the Dutch building industry.

The setup of this study

When the objective of this study (validating the theoretical framework and attributing weights) is combined with the methodology of the Fuzzy Delphi Method, the structure of this study emerges. This is depicted in figure 4.2.

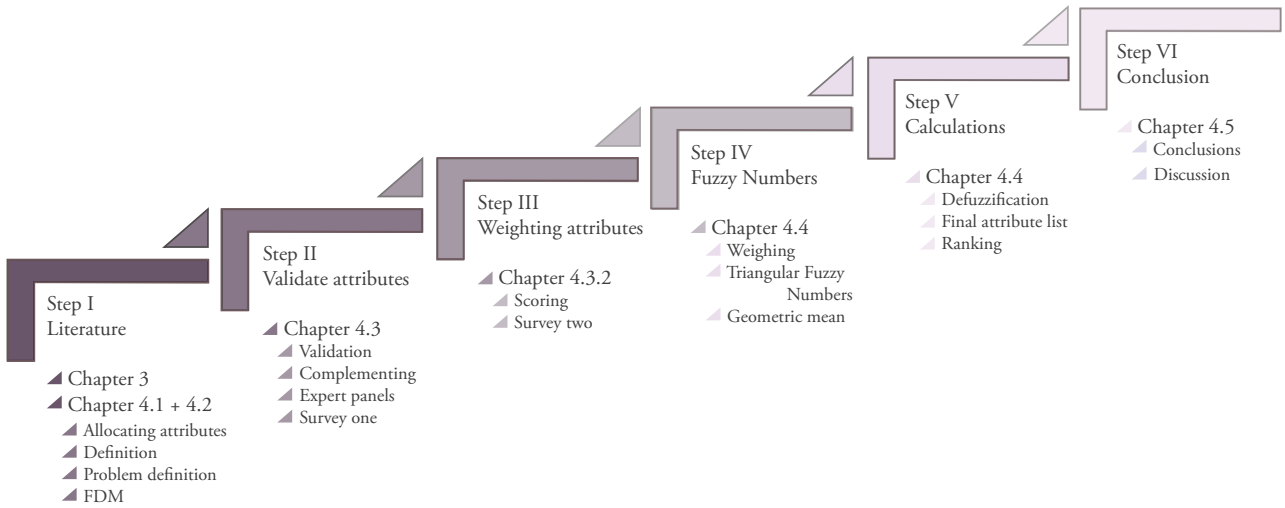

Figure 4.2. Set up of this study

The Fuzzy Delphi Method is a suitable method in regard with the nature and the objective of this study. FDM is used in this study because:

1. FDM is often used when current scientific research on a topic is limited (Ho and Wang, 2008);
2. FDM is designed and used successfully to evaluate and define attributes and factors (Chang, Huang, and Lin, 2000);
3. The evaluation of the topic of this study requires special knowledge of both the building industry and innovation and therefore, experts in these fields must be consulted (Philips, 2000);
4. FDM is very useful when bringing all experts together is expensive and difficult. Which is the case here, since many top managers and innovation managers throughout the Netherlands will be consulted (Turoff, 1970; Chang et al., 2000);
5. FDM requires less round of surveys when compared to its predecessor, the Delphi Method. This makes it less time-consuming and thus more fitted for this thesis study (Ishikawa et al., 1993).

The FDM follows five steps: (1) validating the predefined list of attributes, (2) collecting experts' opinions, (3) set up fuzzy numbers, (4) defuzzification, and (5) screen evaluation indexes.

This study will use two expert panels: (1) top management and (2) innovation management.

4.3 Research Model and survey design

Section 4.2 explains the Fuzzy Delphi Method, its history, and how and why it is employed in this study. The FDM will be used to determine the entrepreneurial attributes that influence innovation in a building organization. FDM evaluates the predefined list of attributes (the theoretical framework), validates this list, and weighs the validated attributes. This evaluation and scoring is performed by expert whom are working in the building industry and are knowledgeable in innovation, management, and entrepreneurship.

The objective of this FDM study is to gain a list of attributes that depict the impact of entrepreneurial and innovative actions and behaviors on the innovative power of a building organization in the Netherlands. This list can be used for scientific as well as practical purposes. It is the foundation for further research that will be constructed in this graduation project, as well as other research. The practical use of this list is to evaluate organizations and to be able to see where and how managerial actions can be taken in order to enhance innovation.

The foundation for the FDM research, is the predefined list of attributes as gained by an evaluation of literature. This theoretical framework (figure 4.1) combines research in the field of the building industry, innovation, and Corporate Entrepreneurship. This list of attributes can be found in Appendix B.

Identification of experts

In the FDM method, expert panels are used to evaluate theoretical knowledge that has limited scientific background (see section 4.2). The experts are identified by several moderators at Bouwend Nederland. These moderators are; the representatives of; large organizations (Harry Wisse), of semi-large and middle-sized organizations (Helen Visser), and

of smaller organizations (Arjan Walinga). Other instruments that are employed in searching experts is the network of the researcher, websites of building organizations, and networking platform Linked In.

The first expert panel – Top Management
The first panel consists of people in Top Management positions. This is a common used expert group in research about Corporate Entrepreneurship (Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013). The top managers are professionals with the job function of 'CEO', 'director', or 'division director'. They are employed by large to medium sized building organization in the Netherlands.

The second expert panel – Innovation Management
The second panel is more difficult to define. It consists of people who are active in the innovation development and application in the building industry. Since 'innovation management' is not a common used function in the industry, several job function that also incorporate a lot of work with the innovation management of an organization are also attributed to this category. This include professionals employed in 'business development', 'specialist innovation', and 'innovation advisor'.

Validating the attributes: survey one

The first survey is used in order to validate the predefined list of attributes. Only attributes which are not validated in prior research are evaluated in this survey, in order to keep the questionnaire short and relevant. This results is that all innovation barriers from the theoretical framework are left out, since they are already all very often proven in prior scientific work. An overview of evaluated attributes in this survey can be found in Appendix H.

The questionnaire
The questionnaire is constructed with the online tool 'Survey Monkey'. This tool gives the researcher a lot of freedom in lay out, and give a clear overview (in text and graphs) of the results (both individual and group responses). In this questionnaire, experts must evaluate factors and actions on their relevance in relation to the innovativeness of a building organization in the Netherlands.

They could score each individual attribute 'positive effect', 'no effect', 'negative effect' or 'can't'
An example of a question from survey one is given in Appendix G.

The survey is constructed in Dutch, since all respondents are Dutch. This decreases the risk of miscommunication and misinterpretation. Therefore, depictions of this survey are mostly in Dutch, but all results are processed in English.

Channels
The first survey is spread through various channels. All experts who had a known email address, received a personal email with an invitation to join this research. Furthermore, an article was place on the website of Bouwend Nederland: http://www.bouwendnederland.nl /nieuws/ 1750275/ onderzoek-innovatie-in-de-bouw--doe-mee. This article was also shared on LinkedIn and Twitter.

Respondents
Several experts are approached individually on bases of their job function. Of each panel (top management and innovation management), at least 10 experts have to participate. In table 4.2 the respondents are categorized to the position that a respondent holds in the organization. The table also depicts the response rate of each position category.

Table 4.2 Respondents survey one

Category	Panel	Number of respondents	Response rate (% of addressed)
CEO / (general) director	Top Management	13	41%
Division director	Top Management	3	75%
Innovation Manager	Innovation Management	2	100%
Specialist innovation (BIM, sustainability, etc.)	Innovation Management	5	36%
Business Development	Innovation Management	2	67%
Advisor	Innovation Management	3	50%
Other	Innovation Management	3	60%
Total Top Management	Top Management	16	44%
Total Innovation Management	Innovation Management	15	50%
Total		31	47%

Results survey one

The first survey evaluates the predefined attribute list; it validates and completes it. The result of this survey is the input for the second survey which attaches weights to the attributes. In order to properly and clearly depict and process the results from the first survey, a coding system is introduced. This system can be found in Appendix F.

Validation table

The responses from all experts are shown in Appendix J. These responses are summarized in figure 4.3 which depict the percentage of agreement of each attribute. In this graph, it can be seen, that all attributes have a general agreement of over 50%; all attributes are valued to have a positive effect on the innovativeness of an organization in the building industry.

The graphic depiction of all individual attributes can be found in appendix K. The validated attributes are depicted in table 4.3, with the percentage of agreement on the direction of their value.

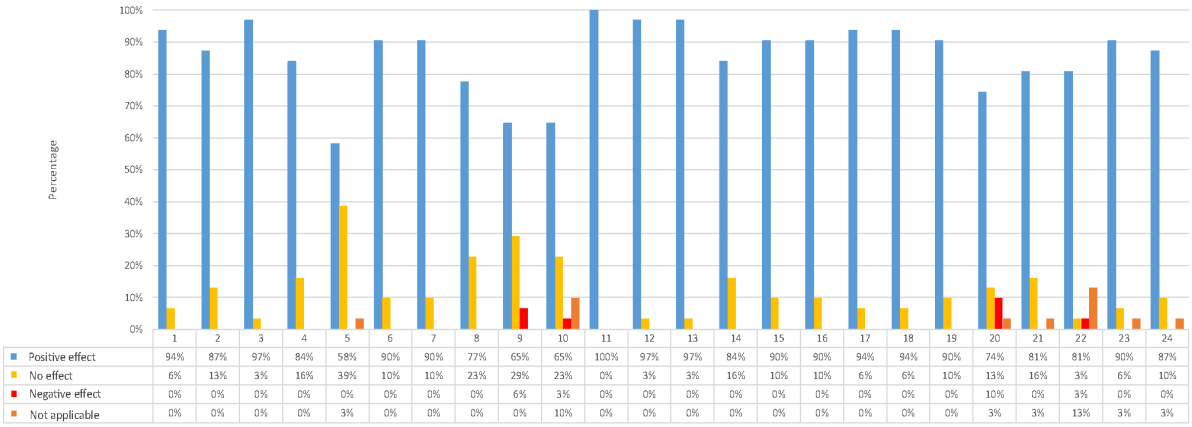

Figure 4.3 Result of the first survey – all respondents

Table 4.3 The validated attributes – result survey one

ID code	Attribute	Direction of effect	Agreement percentage
Q1.1	The organizational structure is arranged in a fashion that creates room for innovation.	Positive	94%
Q1.2	Flexibility in the organizational structure (in space, planning, finance etc.).	Positive	87%
Q1.3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge).	Positive	97%
Q1.4	The organization accepts mistakes from its members.	Positive	84%
Q1.5	Conflict between members in accepted and dealt with constructively.	Positive	58%
Q.1.6	The organization stimulates a critical attitude from members towards the status quo.	Positive	90%
Q1.7	The organization uses projects to test and implement innovations.	Positive	90%
Q1.8	The selection process of projects takes its innovative potential into account.	Positive	77%
Q1.9	Business cases are created and are the foundation for project planning.	Positive	65%
Q1.10	Project planning incorporates time for innovative activities.	Positive	65%
Q1.11	Top management support.	Positive	100%
Q1.12	The organization performs intensive scanning activities.	Positive	97%
Q1.13	The organization maintains contact with its network.	Positive	97%
Q1.14	An entrepreneurial vision.	Positive	84%
Q1.15	Entrepreneurial attitude and the performance of entrepreneurial activities are part of the organizational culture.	Positive	90%
Q1.16	Employees are attracted to entrepreneurial activities.	Positive	90%
Q1.17	The organization stimulates and encourages its members to act entrepreneurial.	Positive	94%
Q1.18	The organization offers recourses to members to employ entrepreneurial activities.	Positive	94%
Q1.19	Experts offer relevant knowledge to organizational members.	Positive	90%
Q1.20	Members are stimulated to take risks.	Positive	74%
Q1.21	The reward system takes into account the innovativeness and entrepreneurial activities of an employee.	Positive	81%
Q1.22	The client creates space for innovation in a project.	Positive	81%
Q1.23	Research and Development activities.	Positive	90%
Q1.24	Promotion and enabling of integration in the value chain.	Positive	87%

Table 4.4 Added attributes.

Attribute	Direction of effect
Give attention to inspiring examples	Positive
Constant education of organizational members; the reflective practitioner.	Positive
Increase and stimulate contact between different generation and people with different level of experience.	Positive
Making innovations measurable.	Positive

Added attributes

The respondents had the opportunity to add attributes to the predefined list. Attributes that were mentioned several time (by two or more respondents) are added to the attribute list and depicted in table 4.4. The complete list of remarks and attributes made by respondent can be found in Appendix I.

Weighting the attributes: survey two

Questionnaire

The second questionnaire is constructed with the forms application of Google. This tool provides the opportunity to ask an unlimited amount of questions to an unlimited amount of people. All the results are exportable to excel. This make it the right tool for this questionnaire. The questionnaire is constructed in Dutch, since it is the native language of all respondents.

The respondent can value each attribute on a scale of zero to ten on three effects; the minimum effect of the attribute, the optimal effect of the attribute, and the maximum effect. They can base their valuation on the given graphs that depict the answers given by all respondents in the first survey. The questionnaire (in Dutch) is given in Appendix L.

Channels

The second survey is offered to the respondents via two channels. First, they are invited to join by email, with a reminder email sent two weeks later. They are also approached by mail, with a hardcopy of the questionnaire for those who prefer that method.

Respondents

The possible participants for this survey are limited to the respondents of the first survey. The following table 4.5 shows how many of them participated.

Table 4.5 Respondents second survey

Category	Panel	Number of respondents first survey	Number of respondents second survey	Response rate (% of addressed)
CEO / (general) director	Top Management	13	8	62%
Division director	Top Management	3	3	100%
Innovation Manager	Innovation Management	2	2	100%
Specialist innovation (BIM, sustainability, etc.)	Innovation Management	5	3	60%
Business Development	Innovation Management	2	2	100%
Advisor	Innovation Management	3	3	100%
Other	Innovation Management	3	0	0%
Total Top Management	Top Management	16	11	69%
Total Innovation Management	Innovation Management	15	10	67%
Total		31	21	68%

Coding

The relevant attributes are identified in survey one and are weighted and ranked in survey two. Each participant evaluated all attributes on three criteria: its minimum effect on innovation (a), its maximum effect (c) on innovation and its optimum (b). In total, 40 attributes were evaluated (N=40) in this study; 28 attributes with a positive effect on innovation, and 12 attributes with a negative effect on innovation in the building industry. They were evaluated by 21 experts (N=21).

In order to properly and clearly depict and process the results from the first survey, a coding system is introduced. This system can be found in Appendix F.

Several options where given to the respondents; they could evaluate the variables on a scale 0 to 10, but they could also express their disagreement with the general opinion. In the first and second part of the survey (about incentives for innovation), they could say that they thought the attribute did not have a 'positive effect' but 'a negative effect' or was 'not applicable'. In the third part of the survey, about barriers of innovation, they could state that the attribute has 'a positive effect' or 'does not exist'. Table 4.6 shows the divergent opinions and the value that is attributes to them in the final calculations.

Dataset

Table 4.7 shows a part of the dataset with a ten point scale, the complete dataset can be found in Appendix M.

The dataset is constructed with a ten-point scale with linguistic values. The Fuzzy Delphi Method transforms these values into numbers that represent the fuzzification of respondents' expression. The survey asked respondents to fill in a minimum (a), optimum (b) and maximum (c) value for the effect of the attribute on innovation. Each of these values has to be translated into a correspondent fuzzy number. This translation is done according to the method developed by Chen (2000). Since the respondents ranked the attributes on a scale 0 (no effect) to 10 (very large effect), creating fuzzy numbers is an easy calculation where the fuzzy number of an attribute ($w_{ij} = a_{ij} + b_{ij} + c_{ij}$) varies from 0.0 (for value 0, no effect) to 1.0 (for value 10, very large effect).

Table 4.6 Divergent opinions

Divergent opinion	Times expressed	Contributed scoring	Explanation
Negative effect	0	Does not apply	Does not apply
Not applicable	5 [1.5; 1.8; 1.10; 1.10 ; 1.22]	0	When the attribute is not applicable, its effect will be zero on the overall innovativeness of an organization.
Positive effect	10 [3.3; 3.5; 3.5; 3.5; 3.5; 3.5; 3.10; 3.10; 3.11; 3.11]	0	Fuzzy Delphi is a method that focusses consensus, therefore this divergent opinion is left out of the total evaluation score of the attribute. However, it is taken into consideration in the discussion. The attributed score is 0, since the respondents does not think the variable has a value on the negative scale.
Does not exist	12 [3.1; 3.2; 3.4; 3.4; 3.6; 3.6; 3.7; 3.10; 3.11; 3.11; 3.12; 3.12]	0	When the barrier does not exist, its effect on the overall innovativeness of the organization is zero.

Table 4.7 Indication of gathered opinions (on a ten-point scale)

1. The organizational structure creates room for innovation

Expert	min (a)	opt (b)	max (c)	(…;…;…;)
1	10	10	10	(10;10;10)
2	2	4	8	(2;4;8)
3	9	9	9	(9;9;9)
4	7	8	9	(7;8;9)
5	9	9	9	(9;9;9)
…	…	…	…	(…,…,…)
21	5	7	9	(5;7;9)

4.4 Analysis of survey results

Validated and weighted attributes

After the data set is complete, the survey results can be obtained. The first step is to calculate the overall value of each factor. This calculation can employ various methods (Habibi et al., 2015). This study uses the most used approach where $W_j = a_j + b_j + c_j$ where, $a_j = \min_j\{a_{ij}\}$, $b_j = \frac{1}{n}\sum_{i=1}^{n} b_{ij}$ and $c_j = \max_j\{c_{ij}\}$. W_j is the opinion's mean, n is the number of attributes evaluated (Chen, 2014). These overall triangular fuzzy numbers of each factor can then be converted into a single number; the process of defuzzification. This process results in a crisp value S_j of each attributes, providing insight in its (relative) importance. The study employs the graded mean integration representation method as developed by Chen and Hsieh (Chou et al., 2011). The crisp value Sj is determined by the formula $\frac{a_j+4b_j+c_j}{6}$ (Ding, 2008; Glumac, 2012; Wang et al., 2009; Zang and Xing, 2010). The optimum value is the most valuable number in this study, therefore it outweighs the minimum and maximum value with four to one. Table 4.8 partially shows the crisp values S_j.

A screening threshold was put in place to highlight the attributes with a medium to high effect. The threshold for this study is: {Sj < -0.500, retain; -0.500 < Sj < 0.500, reject; Sj > 0.500 retain}. This threshold was place due to the goal of this study to identify relevant attributes. The crisp values their evaluation in relation to the threshold value can be found in Appendix N.

With the threshold value placed at 0.500, 36 attributes were retained. Of these all innovation boosters were retained (N=28), and of the innovation barriers 4 were rejected (N=8). An overview of the retained attributes, in ranking from a high to low crisp value is given in table 4.9 (boosters) and table 4.10 (barriers). Figure 4.4 and 4.5 give a visual representation of the crisp values of all the attributes.

The threshold is set on 0.500 (for positive attributes) and -0.500 (for negative attributes) because of it's results on the retained attributes. When the screening threshold is set on 0.500/-0.500 the attributes that have a disputed direction are deemed 'rejected'. This results is a more relevant results, since only attribute with a high consensus rate on their direction are left in this study. Future research should define the attributes that are rejected in this study.

Table 4.8 Defuzzification results of aggregated experts' value

ID code	Attribute	Direction	Crisp value (S_j)	Retained/rejected
1	The organizational structure is arranged in a fashion that creates room for innovation.	Positive	0.630	Retained
2	Flexibility in the organizational structure (in space, planning, finance etc.).	Positive	0.608	Retained
3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge).	Positive	0.663	Retained
4	The organization accepts mistakes from its members.	Positive	0.641	Retained
…	[…]	Positive	…	…
28	Making innovations measurable	Positive	0.584	Retained
29	The fragmented nature of the building process	Negative	-0.546	Retained
…	[…]	Negative	…	…
40	The building industry is project based	Negative	-0.458	Rejected

Table 4.9 Overview of retained attributes and the crisp value; innovation boosters

Rank	Attribute number	Attribute	Crisp value (S_j)
1	11	Top management support	0.730
2	18	The organization offers resources to members to employ entrepreneurial activities	0.686
3	15	Entrepreneurial attitude and performance of entrepreneurial activities are part of the organizational culture	0.673
4	3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge)	0.663
4	7	The organization uses projects to test and implement innovations	0.663
4	12	The organization performs intensive scanning activities	0.663
7	17	The organization stimulates and encourages its members to act entrepreneurial	0.647
7	27	Stimulate contact between generations; new, experiences, young and old employees	0.647
9	4	The organization accepts mistakes from its members	0.641
10	26	Constant education of new and experiences employees (reflective practitioner)	0.638
11	16	Employees are attracted to entrepreneurial activities	0.637
12	1	The organizational structure is arranged in a fashion that creates room for innovation	0.630
13	6	The organization stimulates a critical attitude from members towards the status quo	0.628
14	13	The organization maintains contact with its network	0.614
15	21	The reward system takes into account the innovativeness and entrepreneurial activities of an employee	0.612
15	25	Draw attention to inspiring examples	0.612
17	2	Flexibility in the organization structure (in space, planning, finance etc.)	0.608
18	22	The client creates space for innovation in a project	0.605
19	28	Making innovation measurable	0.602
20	23	Research and Development activities	0.599
21	8	The selection process if projects takes its innovative potential into account	0.598
22	19	Experts offer relevant knowledge to organizational members	0.595
23	20	Members are stimulated to take risks	0.580
24	24	Promotion and enabling of integration in the value chain	0.574
25	14	An entrepreneurial vision	0.570
26	10	Project planning incorporates time for innovative activities	0.557
27	9	Business cases are created and are the foundation for project planning	0.554
28	5	Conflict between members are accepted and dealt with constructively	0.500

Table 4.10 Overview of retained attributes and the crisp value; innovation barriers

Rank	Attribute number	Attribute	Crisp value (S_j)
1	36	Traditional contract forms	-0.612
2	37	Limited investment in research	-0.573
3	29	The fragmented nature of the building industry	-0.553
4	31	The role of the client	-0.541
4	38	The industry has a low perceived innovation-drive level	-0.541
6	35	Restrictions by laws and regulations	-0.532
7	30	The market structure	-0.531
8	39	Lack of recognitions, promotion, and reward of creativity, quality of work, and innovation.	-0.522

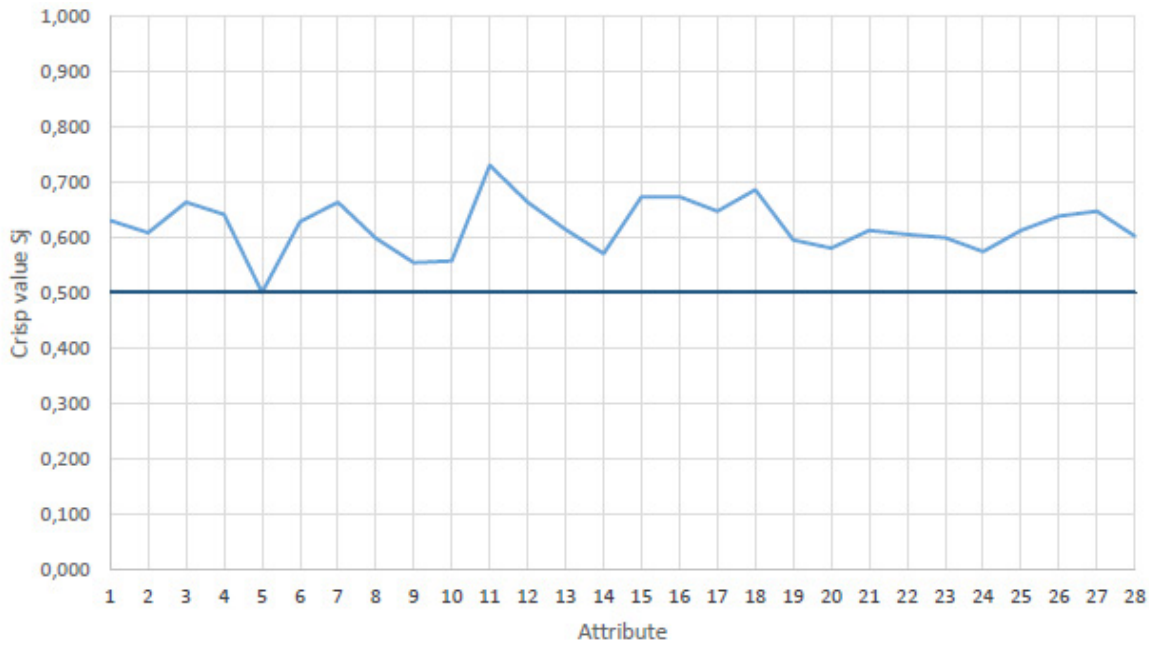

Figure 4.4. A visual representation of the crisp values for each attribute with a positive effect on innovation

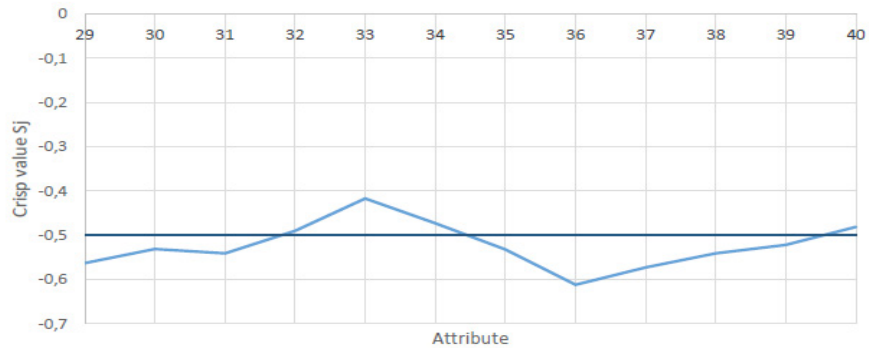

Figure 4.5 A visual representation of the crisp value of each attribute with a negative effect on innovation.

Range

In addition to the crisp value, the range of each attribute (the difference between the minimum and the optimum, as well as the difference between the maximum and the optimum) was evaluated. The range of each attribute is made visual in figure 4.6 and 4.7. It shows the mean collective opinion of experts on the minimum, optimum and maximum effect that the attribute has.

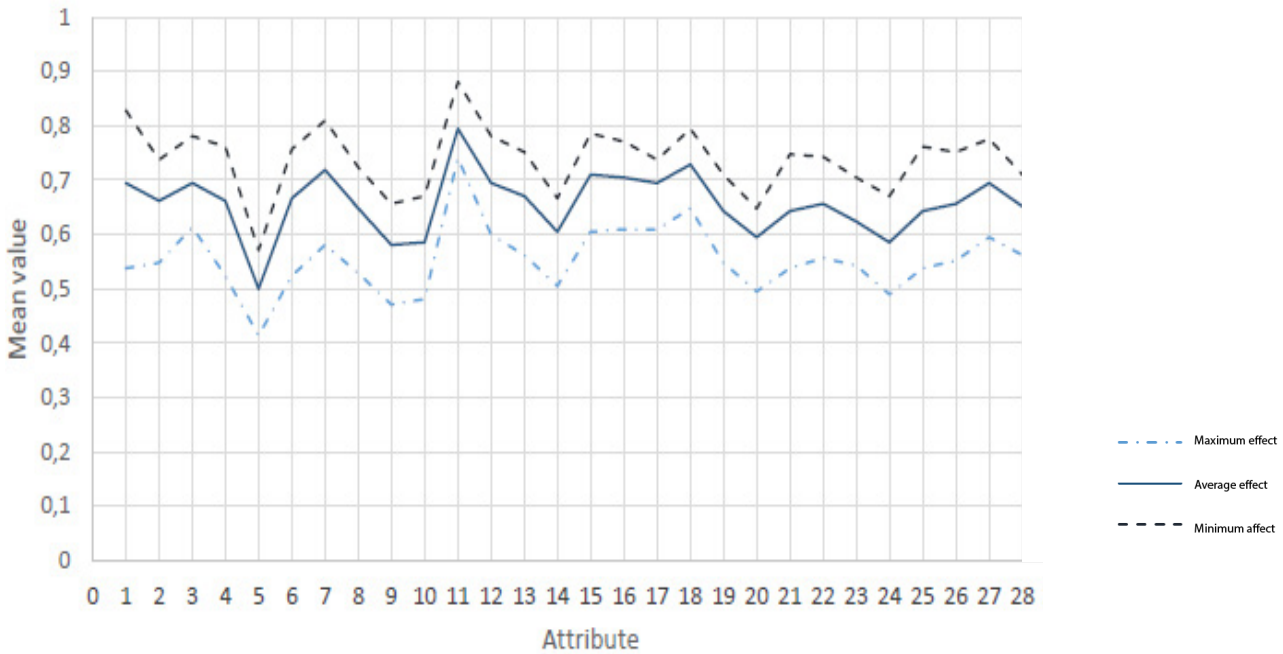

Figure 4.6 A visual representation of the collective opinion on minimum, optimum, and maximum value for innovation boosters.

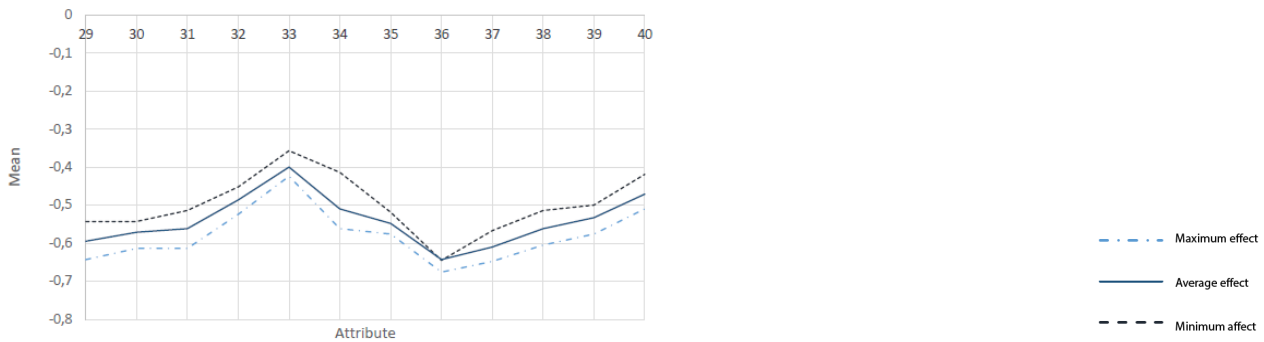

Figure 4.7 A visual representation of the collective opinion on minimum, optimum, and maximum value for innovation barriers.

A screening threshold is set up to highlight the attributes with the widest distribution. Most attributes do not have a wide distribution, their minimum, optimum and maximum score are not far apart. The attributes with a total distribution of ≥ 0.175. This threshold is chosen because the distribution is very low. When the threshold value would be higher, no attributes would meet it. The attributes that meet the threshold value are depicted in table 4.11. In general, the distribution range of the attributes is very low.

Consensus

Another important characteristic of the attributes is whether or not it has a consensus amongst the experts. This is measured by using the proposed method of Christie and Barela (2005); experts' opinions should fall two point above or below the mean in order to be categorized as 'consensuses'. When translated to the fuzzy numbers of this study, this means that the expert opinion should fall 0.2 above or below the mean (|Sj – Sj_individual| > 0.2 = no consensus). The consensus criterion is set on 70 %; 70 percent of all experts must be 'in consensuses with the general crisp value Sj. All consensus levels in relation to the opinion can be found in Appendix N. The consensus analyses shows that there are 24 attributes that reach consensus (positive effect: N = 23; negative effect: N=1).

The consensus tables show that there are two respondents who deviate greatly from the rest. These two respondents only have a consensus level of respectively 25 and 22 percent. All the other experts have a level of above 52 percent. In order to evaluate what happens to the results of this research when these two outsiders are left out, the crisp value of the attributes is evaluated again, without the responses of these two persons. The results of this are given in table 4.12 and 4.13.

Table 4.11 Attributes with range > 0.175

Rank	Attribute number	Attribute	Range
1	1	The organizational structure is arranged in a fashion that creates room for innovation.	0.291
2	3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge).	0.238
3	6	The organization stimulates a critical attitude from members towards the status quo.	0.233
4	7	The organization uses projects to test and implement innovations.	0.229
5	25	Draw attention to inspiring examples	0.224
6	8	The selection process of projects takes its innovative potential into account.	0.195
7	9	Business cases are created and are the foundation for project planning.	0.186
	22	The client creates space for innovation in a project.	0.186
9	12	The organization performs intensive scanning activities.	0.181
	15	Entrepreneurial attitude and the performance of entrepreneurial activities are part of the organizational culture.	0.181
	24	Promotion and enabling of integration in the value chain.	0.181
	27	Stimulate contact between generations; new, experienced, young, old employees.	0.181

Table 4.12 Positive attributes and their crisp value, without the outsiders.

Rank new	Rank original	Attribute number	Attribute	Crisp value (S_j)	Crisp value new (S_{j_new})	S_j - S_{j_new}
1	1	11	Top management support	0.730	0.719	0.011
2	2	18	The organization offers recourses to members to employ entrepreneurial activities	0.686	0.670	0.016
3	3	15	Entrepreneurial attitude and performance of entrepreneurial activities are part of the organizational culture	0.673	0.663	0.010
4	4	7	The organization uses projects to test and implement innovations	0.663	0.650	0.013
5	4	3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge)	0.663	0.649	0.014
5	4	12	The organization performs intensive scanning activities	0.663	0.649	0.014
7	12	1	The organizational structure is arranged in a fashion that creates room for innovation	0.630	0.637	-0.007
8	7	27	Stimulate contact between generations; new, experiences, young and old employees	0.647	0.636	0.011
9	9	4	The organization accepts mistakes from its members	0.641	0.625	0.016
9	10	26	Constant education of new and experiences employees (reflective practitioner)	0.638	0.625	0.013
11	11	16	Employees are attracted to entrepreneurial activities	0.637	0.623	0.014
12	7	17	The organization stimulates and encourages its members to act entrepreneurial	0.647	0.612	0.035
13	13	6	The organization stimulates a critical attitude from members towards the status quo	0.628	0.611	0.017
14	15	21	The reward system takes into account the innovativeness and entrepreneurial activities of an employee	0.612	0.601	0.011
15	15	25	Draw attention to inspiring examples	0.612	0.597	0.015
16	14	13	The organization maintains contact with its network	0.614	0.595	0.019
16	17	2	Flexibility in the organization structure (in space, planning, finance etc.)	0.608	0.595	0.013
18	18	22	The client creates space for innovation in a project	0.605	0.588	0.017
18	21	8	The selection process if projects takes its innovative potential into account	0.598	0.588	0.010
20	19	28	Making innovation measurable	0.602	0.584	0.018
21	20	23	Research and Development activities	0.599	0.580	0.019
22	22	19	Experts offer relevant knowledge to organizational members	0.595	0.577	0.018
23	25	14	An entrepreneurial vision	0.570	0.553	0.017
24	24	24	Promotion and enabling of integration in the value chain	0.574	0.552	0.022
25	23	20	Members are stimulated to take risks	0.580	0.546	0.034
25	26	10	Project planning incorporates time for innovative activities	0.557	0.546	0.011
27	27	9	Business cases are created and are the foundation for project planning	0.554	0.535	0.009
28	28	5	Conflict between members are accepted and dealt with constructively	0.500	0.482	0.018

Table 4.13 Negative attributes and their crisp value, without the outsiders.

Rank new	Rank_ original	Attribute number	Attribute	Crisp value original (S_{j_or})	Crisp value new (S_{j_new})	S_j - S_{j_new}
1	1	36	Traditional contract forms	-0.612	-0.594	0.016
2	2	37	Limited investment in research	-0.573	-0.556	0.017
3	3	29	The fragmented nature of the building industry	-0.553	-0.546	0.007
4	4	38	The industry has a low perceived innovation-drive level	-0.541	-0.528	0.013
5	4	31	The role of the client	-0.541	-0.518	0.023
5	6	35	Restrictions by laws and regulations	-0.532	-0.518	0.014
7	7	30	The market structure	-0.531	-0.515	0.016
8	8	39	Lack of recognitions, promotion, and reward of creativity, quality of work, and innovation.	-0.522	-0.500	0.022

All rejected attributes still do not reach the threshold level of 0.5, and thus stay rejected. One of the previous retained attributes now fails to reach the threshold variable. Attribute five, with a crisp value of 0.482, 'conflict between members are accepted and dealt with constructively'.

This analysis shows small changes. In the attributes with a positive effect on innovation, attribute one (The organizational structure is arranged in a fashion that creates room for innovation) and attribute seventeen (The organization stimulates and encourages its members to act entrepreneurial) switch places 7 and 12. Where attribute one is evaluated higher without the outsiders. Attribute one is the only attribute that gets a higher crisp value after the outsiders are deleted (an increase of 0.007) all the other attributes decrease.

In order to find out more about the outsiders, a closer look in their answers is taken. The outsiders are respondents 4 and 19. Respondent 4 is an innovation manager and he has an overall higher evaluation score. This goes for both the positive attributes as for the negative attributes. Thus, he ranks all attributes in general more influential than other respondents. Respondent 19 is a top manager and has the same tendency to evaluate all attributes more influential than other respondents. Because there are only two 'outsiders', even though they rank attributes relatively influential, their answers do not hugely influence the total crisp values of attributes.

A criterion can be set in order to highlight the 'biggest changers'; attributes that have a relatively large change in their crisp value when outsiders are left out of the study. This criterion is set on 0.02 (Sj - Sj_new > 0.02). The big changers are seen in table 4.14.

Deviation between expert groups

The Fuzzy Delphi Method uses different expert group to evaluate attributes. This study employs two groups; (1) innovation management and (2) top management. The first group has 10 experts, the second group has 11 experts. The differences between these groups indicate whether a person's characteristics (in this case; job function) has an effect on his perception of an attribute. Figures 4.8 and 4.9 show the overall crisp value of attributes (Sj), as well as the crisp value of innovation managers (Sj_IM), and by top managers (Sj_TM).

Table 4.14 The biggest changers

Changers rank	Attribute number	Attribute	S_j - S_{j_new}
1	17	The organization stimulates and encourages its members to act entrepreneurial	0.035
2	20	Members are stimulated to take risks	0.034
3	31	The role of the client	0.023
4	24	Promotion and enabling of integration in the value chain	0.022
4	39	Lack of recognitions, promotion, and reward of creativity, quality of work, and innovation.	0.022

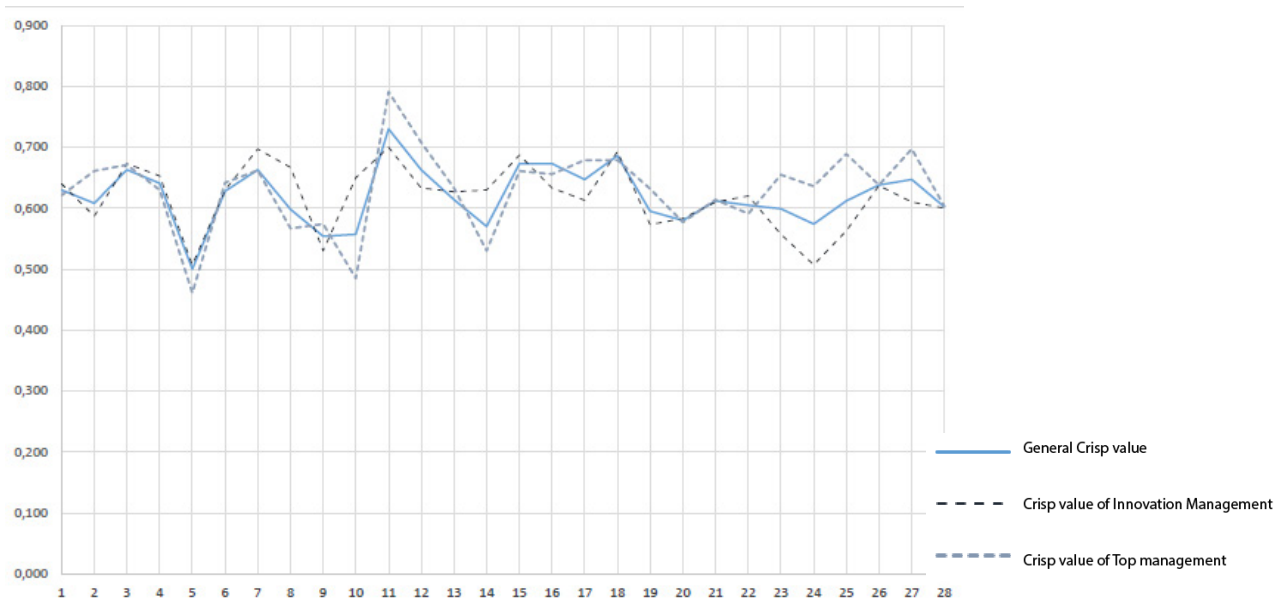

Figure 4.8 Difference between expert groups; innovation boosters

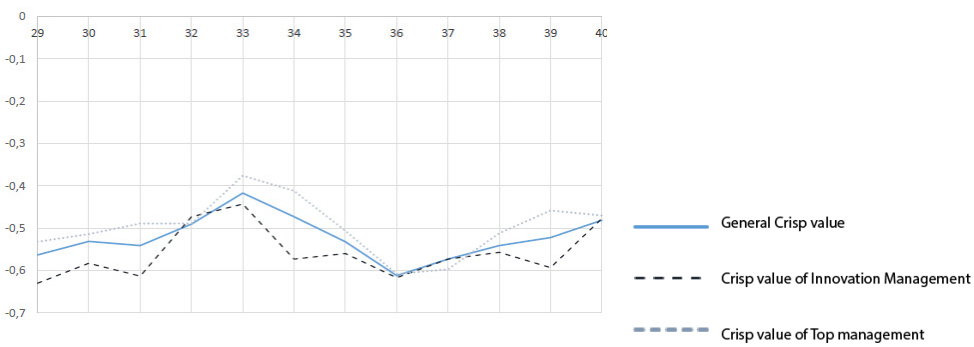

Figure 4.9 Difference between expert groups; innovation barriers

An analysis on the data is conducted in order to evaluate whether there are statistical differences between the expert groups 'innovation management' and 'top management'. The presence of these statistical differences indicate whether an attributes value depends on the characteristics of the person evaluating it.

Because this study identifies two expert groups, a t-test is a suitable fit to locate whether there are significant differences between the two expert groups. Welch's t-test (the unequal valiances form of a t-test) is used. Welch's test is used because the two sample sizes aren't similar; there are 11 top managers, and 10 innovation managers. The test compares the evaluation scores by individuals in one group (1.0), with the evaluation score of another group (2.0) ('innovation management = 1.0' and 'top management = 2.0').

The results of this test are given in Appendix O. As can be seen, only one attribute has a significant difference between the expert groups. This is attribute 25 'draw attention to inspiring example' with a significance level of 0.037. By employing a Kruskal-Wallis test, the direction of the difference is evaluated. The test shows that the innovation managers have a much lower evaluation score than the top managers. The other attributes do not show a significant difference between the two groups.

4.5. Implication and discussion

This study evaluated the attributes that contribute to an entrepreneurial and innovative building organization. Using the concept of Corporate Entrepreneurship, a theoretical framework of these attributes was developed. This framework was validated and elaborated by employing the Fuzzy Delphi Method. A panel of experts on innovation identified the effect that the attributes had on the innovativeness of a building organization. Each attributes was ranked in a three point range: its minimum, optimum, and maximum value.

This section evaluates some predefined hypotheses about the outcome of this study, the deviations between the hypotheses and this results, the practical implications of this study, and its limitations. Most important, this section reviews the objective of this study to 'validate the theoretical model on Corporate Entrepreneurship in the building industry'.

Interpretation of results: hypotheses

This study is first of its kind in the Dutch building industry, therefore it can be helpful to determine a set of hypotheses about the outcome of this study. These hypotheses will help to determine whether the study supports current thinking, what new information it brings to light, and where deviations in research and practice may occur.

These hypotheses are constructed based on two sources. The main source is A. Walinga. A professional with a lot of experience in the Dutch building industry. He is employed at 'Bouwend Nederland' the Dutch branch organization of builders and has, in his position of representative of over a 1000 building organizations and his activities in innovative branches such as BIM, build up a great deal of experience about the ins and outs of the sector. His hypotheses are brought together with expectations that arise from scientific literature about increasing innovation in the building industry, and the application of Corporate Entrepreneurship. Using the literature on the application of Corporate Entrepreneurship in other industries, will help to determine where the building industry differs from other industries. The hypothesis can be in consensus with the results of this study, in which case it is endorsed. The hypothesis can deviate from the results of this study, in which case the hypothesis is not endorsed. Some hypothesis exist of multiple parts, or cannot be fully endorsed. These hypotheses will get the label 'partly endorsed'.

Part one: innovation incentives, risk taking and top management support.

Hypothesis 1: The most important attributes to stimulate innovation in a building organizations are (1) a business culture that supports failure and risk taking, (2) rewarding innovative behavior and getting support from top management, (3) resources are available to act innovative, and (4) the organization has a close connection to its customers and their wants and needs.

This hypothesis is developed by A. Walinga and supported by the following literature: Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, Ireland, Covin and Kuratko, 2009; Kuratko, Ireland and Hornsby, 2001; 2006; Ling, 2003; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013.

From this information it can be derived that the study partly support the hypothesis. The attributes from the hypothesis 'Rewarding innovative behavior and getting support from top management' and 'Resources are available to act innovative' are both endorsed by this study with relative high ranking and weights. However, the supposed importance of 'a business culture that support failure and risk taking' is not endorsed, with it only appearing on the list with a ranking nine and twenty-three. The supposed importance of 'the organization has a close connection to its customers and their wants and needs' is neither endorsed nor supported with a deviated ranking that varies between four and twenty-four.

HP 1: Partly endorsed

Table 4.15 Hypothesis one: evaluation

HP 1 component	Attributes in survey	Rank of attribute	Score of attributes	Endorsement
A business culture that support failure and risk taking.	The organization accepts mistakes from its members.	9	0.641	No
	Members are stimulated to take risks.	23	0.580	
Rewarding innovative behavior and getting support from top management.	Top management support	1	0.730	Yes
	The reward system takes into account the innovativeness and entrepreneurial activities of an employee	15	0.612	
Resources are available to act innovative.	The organization offers recourses to members to employ entrepreneurial activities	2	0.686	Yes
	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge)	4	0.663	
The organization has a close connection to its customers and their wants and needs.	The organization performs intensive scanning activities	4	0.663	Inconclusive
	The organization maintains contact with its network	14	0.614	
	The client creates space for innovation in a project	18	0.605	
	Promotion and enabling of integration in the value chain	24	0.574	

Hypothesis 2: The creation of an entrepreneurial vision is an important incentives towards innovation

This hypothesis is founded on scientific literature on Corporate Entrepreneurship (Ireland, Covin and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001)

An incentive attribute that is addressed frequently in prior literature, and mentioned as one of the corner stones of a successful Corporate Entrepreneurship venture. The entrepreneurial vision is ranked not important by the experts, with a ranking of twenty-five and a weight of only 0.570.
HP 2: Not endorsed

Hypothesis 3: Increasing Research and Development activities has a large positive effect on innovation in the building industry.

This hypothesis is founded on literature on the increase of innovativeness of the building industry. (De Bruijn and Maas, 2005; Blayse and Manley, 2004; Dulaimi et al., 2002; Winch, 1998).

This is an attribute frequently mentioned in prior literature. A lack of R&D is supposed to be one of the more important reasons why there is a lack in innovation in the building industry while the increase of R&D is mentioned as an important incentive. This study clearly endorses this (lack of investment in research is a barrier to innovation) with a ranking of 2 and a weighting of -0.573. It also endorsed increasing R&D as an incentive method for innovation, with a weight of 0.599. However, it does only appear on the ranking at 20th place. This makes it one of the lowest scoring incentives. Therefore, even though this hypothesis is endorsed, it is further discussed in section 'the deviation between hypothesis and this study' with an attempt to explain why this incentive is deemed essential and one of the most important incentives in existing literature, it is not ranked highly in this study.
HP 3: Endorsed

Part two: Innovation barriers, project based industry and the client.
Hypothesis 4: The most influential barriers for innovation in the building industry are (1) the project based nature of the industry causes a lack of time and financial resources and a lack of communications of solutions found in a specific project. And (2) building organizations have a submissive attitude towards their clients

This hypothesis is developed by A. Walinga and supported by the following literature on the lack of innovation in the building industry: Davidson, 2013; Dulaimi et al., 2002, Miozzo and Dewick, 2005, Winch, 1998. This hypothesis can be reviewed with the results from the second survey that ranks and weights all the attributes.

Part of this hypothesis is supported by the study. The attitude towards the client is indeed a highly ranked barrier. Important to note is that this was not the exact question subjected to the respondents. The first part of the hypothesis, the project based nature, is not supported and is even rejected by the experts as a barrier to innovation.
HP 4: Partly endorsed

Table 4.16 Hypothesis four: evaluation

HP 4 component	Attributes in survey	Rank of attribute	Score of attributes	Endorsement
The project based nature of the industry.	The building industry is project based.	N.A.	0.458	No
Submissive attitude towards the client.	Traditional contract forms	1	0.612	Inconclusive
	The role of the client	4	0.541	

Part three: deviation between expert groups, innovation managers and top managers.

Hypothesis 5: Innovation managers expect more innovation incentives to arise from available resources (financial, time) while top managers have a higher regard for reward systems and top down issues. Furthermore, top managers emphasize more on the client while innovation managers reason from technical possibilities and therefore have more regard for the importance of the project nature of the industry

Hypothesis developed by A. Walinga.

An important thing to notice in this hypothesis is the connection with the Welch's t-test analysis results. This test showed that there are no significant differences between the two expert panels, except on attribute 25 (draw attention to inspiring examples). Therefore, the small differences between group crisp values are not significant and this hypothesis is not endorsed.

HP 5: Not endorsed

Table 4.17 Hypothesis five: evaluation

HP 5 component	Attributes in survey	Crisp value innovation management	Crisp value top management	Endorsement
The innovation managers expect more from available resources.	The organization offers resources to members to employ entrepreneurial activities	0.693	0.679	Inconclusive
	The organization offers resources to stimulate innovative activities performed by members	0.587	0.661	
Top managers have a higher regard for reward systems and for top down issues.	The reward system takes into account the innovativeness and entrepreneurial activities of an employee	0.610	0.614	Inconclusive
	Top management support	0.700	0.791	
	the organizational structure is arranged in a fashion that creates room for innovation	0.640	0.621	
	An entrepreneurial vision	0.630	0.530	
Top management emphasize more on the client.	The organization performs intensive scanning activities	0.633	0.708	Yes
	The organization maintains contact with its network	0.627	0.633	
Innovation managers have more regard for the project based nature of the industry.	The organization uses projects to test and implement innovations	0.697	0.662	Yes
	The selection process of projects takes its innovative potential into account	0.667	0.567	
	Project planning incorporates time for innovative activities	0.650	0.485	
	Business cases are created and are the foundation for project planning	0.530	0.574	

Part four: Internal consensus, agreement within the expert group.

Hypothesis 6: The internal consensus will be highest for the innovation management group. They are closer to reality and thus more likely to agree with each other.

Hypothesis developed by A. Walinga.

The innovation managers have an internal consensus rate of 71% (in 71% of cases, they agree with their group). Top managers have an internal consensus rate of 72%. There is no significant difference between the groups.

HP 6: Not endorsed

The deviation between hypotheses and this study

The hypotheses and their analyses show that not all assumptions are supported by this study. This section will focus on the deviations between the hypotheses and the results of the study, and provide possible directions of study to find the reasons of these deviations. In general, the deviations could be caused by several things such as; (1) not all scientific literature that is used in this study is about the Dutch building industries. Thus, its findings might not be translatable to the Netherlands. (2) Not all parts of the Corporate Entrepreneurial concept can be translated one on one into the building industry. (3) This study is exploratory and thus limited, this might result is incomplete conclusions. (4) A misinterpretation of the results is always a possibility.

Deviation one: the supposed importance of 'a business culture that support failure and risk taking' is not endorsed, with it only appearing on the list with a ranking of nine and twenty-three.

This is a surprising outcome, since this attributed is both valued highly in literature and by the professional. It is also endorsed by one of the respondents, who specifically notes that 'employees should not have the feeling that making a mistake is necessary a bad thing, or they will never try something new'. However, the general consensus is that these attributes (risk taking and acceptance of failure) have a low ranking. There is no significant deviation between the expert groups on this topic. An answer might be sought in literature about risk-taking. John W. Atkinson (1957) writes that the choice of actors to act in a certain way depends on general values. The *'Onderzoeksrapport innovatie in de bouw'* (de Bruijn and Maas, 2005) shows that the building industry has a tendency to avoid financial risks. The low ranking of failure as part of the business culture may be due to fact that failure in construction is perceived as a financial loss. Failure costs in building projects are a huge diminished of profits; around 6.5% of revenue can be contributed to this (BouwKennis, 2012). A lot of failure, thus means a lot of profit loss, which is a problem in a sector that is dealing with very low profits; only 2 percent in 2014 (Bouwend Nederland, 2015). These cultural aspects of the building industry might be the reasons for a low perception of risk and failure as innovation incentives. Future research will have to identify whether the answer really lies in this direction, or in another one.

Deviation two: an incentive attribute that is addressed frequently in prior literature, and mentioned as one of the corner stones of a successful Corporate Entrepreneurship venture is an entrepreneurial vision. However, it is ranked not important by the experts, with a ranking of twenty-five and a weight of only 0.570.

The vision of an organization is its perspective on future actions; or as Simon Sinek (2009) states in his Golden Circle, 'the why'. Innovative organization and industries see this as an essential part of their business, and it drives innovation since it pictures the desired future. However, most building organization focus on the 'What' of their business; what product or services they sell. This might result in a lower evaluation of the 'why' part of the organization; the vision. This might make it an untranslatable attribute of Corporate

Entrepreneurship to the building industry. However this is only one possible explanation, and more research is necessary.

Deviation three: increasing R&D activities is not ranked highly as an incentive for innovation, while it has so far been conceived as extremely important in existing literature.

An unexpected deviation is the low ranking of R&D activities as a way to stimulate innovation. All literature states that this is very important, and other industries use R&D activities frequently to boost innovation. There are no concrete leads to why this should deviate in this study. Perhaps R&D is perceived as difficult and too expensive for one venture alone, perhaps the building industry needs another perspective of R&D than other industries. Future research could identify the reason(s) behind this deviation, and thus contribute to the innovativeness of the building industry.

Deviation four: The project based nature is not perceived as an important barrier to innovation, and is even rejected by the experts.

Although surprising at first site, this rejection of the hypothesis has a certain logic. One of the respondent added to his answer ''so what?". Why would the project based nature of the industry be a barrier? An although this is in conflict with literature about the building industry that state that the project based nature is a great barrier (Davidson, 2013; Dulaimi et al., 2002, Miozzo and Dewick, 2005, Winch, 1998), it is in similarity with literature on project based industries and Corporate Entrepreneurship. Blindenback-Driessen and van den Ende (2006) describe that a project based industry and Corporate Entrepreneurship are a sound match. Frederiksen and Davies (2008) state that a project should be 'understood as a novel entrepreneurial venture to create new markets encompassing new customers' and

"Stimulation from management is an important element in the promotion of innovation"

Expert's explanation on management importance

"The client can have both a positive or a negative influence on innovation"

Expert explains the ambiguous role a client can have

thus as an opportunity to act innovative. Furthermore, literature on increasing innovation states that using a project to test and implement innovations is a sound way to increase innovation. As one of the respondents stated: *"There are plenty of project industries that are innovative, for example the IT sector"*. More research is needed in order to identify why a project based nature is often perceived as a barrier (by both experts and literature) but is not evaluated as such by literature on other industries, and the experts participating in this study.

Deviation five: There is almost no significant difference between the opinions of the two expert panels.

Only one attribute had a significant difference in scoring for both panels, number 25 'drawing attention to inspiring examples' (significant level of 0.037, confidence interval of 95%). Which is valued significantly higher by top managers. This indicates that the two expert group simply do not have very different views on the enhancement of innovation, as well as on the barriers of innovation, in the building industry. More knowledge about the respondents could offer more information. Gender, age or experience could lead to differences between groups. This study can conclude that 'function' is not a characteristics that creates different evaluations. Future research will have to be performed in order to find out if other characteristics do.

Deviation six: The innovation managers do not have a higher internal consensus rate than the top managers. With a small lower for the innovation managers of 71% versus 72% for top managers.

There is no significant difference between the groups when it comes to the internal group consensus rate. There if no direct lead to why the result of this study do not converge with the hypothesis. An important notion for future research is that the internal consensus of other groups should be investigated in order to establish if job function really leads to similar evaluation scores, or if this is just the case for this study, or whether it is solely the case for these two expert groups.

Implication: recommendation for future actions

The Fuzzy Delphi study results in a list of weighted attributes that depict which attributes have the greatest influence on innovation in the Dutch building industry (both positive and negative). The recommendations for future actions are about the most important attributes because they depict the most influential steps the industry as a whole and individual organizations can take in order to become more innovative. This section provides the recommendations related to the five highest ranking incentives for innovation and the five highest ranking barriers to innovation in the building industry. Recommendations on all attributes can be found in appendix Q.

For the increase of innovation, the recommendation for future actions are:

1. *Ensure top management support* – Make sure the top management in on board. Top managers should express the importance of innovative entrepreneurship, and should also perform this behavior themselves. Top management support is essential when implementing changes in the organization.
2. *Provide resources to members* – The road to an innovative and entrepreneurial organization is paved with resources. Money, time, knowledge, space etc., are all required in order to create an environment where members can be entrepreneurial. Reserve these resources and communicate their availability.
3. *Create an entrepreneurial organization culture* – The organizational culture should incorporate an entrepreneurial attitude and activities. This

is essential in the implementation of Corporate Entrepreneurship.

4. *Use projects as vehicles for innovation* – Use projects to test and implement innovation. Perform intense
5. *Scanning activities* – Look at the world outside of the organization. The more knowledge you have of the environment and surroundings of your business, the more entrepreneurial opportunities and innovative ideas will occur.

In regard to the barriers of innovation, the following recommendations are given:

1. *Change the standard contract form* – The current traditional contract that are prescribed by law and habit should no longer be the standard choice when making a tender. Use more modern concepts, such as tendering based on ENVI and integral contract as DBFMO.
2. *Create a more continuous nature* - The fragmented nature of the building industry is a high ranking barrier. This attribute is an addition to the previous recommendation. Integral contract forms will diminish the fragmented nature of the industry, enhance trust, and decrease loss of knowledge.
3. *Convey the necessity for an innovation drive* – Perhaps it is time for the building industry to wake up and realize that without innovation, there is no bright future for traditional organizations. Innovation should be a core concern of building firm in order to stay competitive and relevant.
4. *Modernization of laws and regulations* – Laws and regulations should be updated to modern standard. Less complex regulation will lead to more room for innovation in tendering, project execution, and project result.
5. *A reward system that gives the right incentives* – The current reward system that organizations employ are not rewarding the right actions. Creativity, quality of work, and innovative performance should be a part of the standard reward system in order to boost innovation.

"Freedom offered by top management, as well of a sound vision, create an innovative culture."

One of the experts does not agree with the overall consensus on a lack of importance of the vision

Limitations of this study

Methodological limitations

There are several limitations that are inherent to the Fuzzy Delphi Method (Ho and Wang, 2008). One limitation that did not concern this study was the time consuming nature of the method. Due to personal circumstances of the researcher, time pressure was low and the necessary time to conduct both surveys was available.

A limitation was the necessary involvement of experts. It took a lot of effort to gain enough responses necessary for the validation of the results. The experts had to be addressed several times, via a variety of channels including several emails, phone calls, and the personal network of the researcher.

Another limitation that is mentioned by Ho and Wang (2008) is the fact that extreme opinions are cut out of the final result. As can be seen in chapter 4, this limitation did not effect this study. When the extreme opinions are left out of the analysis, the results do not change significantly.

Study limitations

This study researches a concept that has many attributes that are difficult to define in a non-ambiguous way. For example concepts such as market structure and entrepreneurial behavior are not defined with strict boundaries. Therefore, many of the question where open to the interpretation of the experts. This means that the results of this study will never be absolute, but only an approximation of the truth.

Another limitation in this study is that the expert who participated where solely categorized by function type. This is done in order to create two panels. However, more information about the background of the experts might have helped in clearing out results and answers, and finding more specific reason for deviations in answers and consensus rates.

Recommendation for future research

This study gives an overview of the potential value of the concept of Corporate Entrepreneurship for the building industry. The most important recommendation for future research is the expanse of this field of study. This report is the first of its kind, the first effort performed to gain a deeper understanding about Corporate Entrepreneurship in the building industry. More investigation into this is necessary in order to create more insight in how it works and how it can be implemented in practice.

An important extension of this study would be a research conducted in order to establish the interrelationships between the attributes ranked in this study. Understanding these interrelationship is essential for understanding what an organization can do in order to enhance innovation by employing Corporate Entrepreneurship. These interrelationship could be researched by using case studies (as done in other studies in Corporate Entrepreneurship).

A remarkable aspect of this study is the difference between results of the first survey, and of the second survey. In the first survey, many respondents said an attribute had 'no effect'. However, in the second survey, no respondent gave a score of triple zero, or even a zero for the minimum score. Further research should find out where this deviation comes form, and how it can be managed.

Another related topic is that of the mediocre answers that respondents tend to give. Many respondents do not choose the lowest of highest scores in the second survey. Is this because they truly believe that these are no extreme values for these attributes, or are there other reasons?

Finally, future research should expand the knowledge about differences of opinions between groups. This research shows that there is no significant difference

between the group 'innovation management' and 'top management'. However, it could be that there are significant differences when different function groups or personal characteristics are taken into consideration. These differences are important because it provides more insight into the usability of Corporate Entrepreneurship in the building industry and because they will provide insight into the implementation difficulties organizations will encounter when employing Corporate Entrepreneurship

This study researches a concept that has many attributes that are difficult to define in a non-ambiguous way. [...] Therefore, many of the question where open to the interpretation of the experts. This means that the results of this study will never be absolute, but only an approximation of the truth.

5. Corporate Entrepreneurship in the building industry: an entrepreneurship tool

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Abstract

Corporate Entrepreneurship is a business administration concept towards the creation of a business environment that fosters entrepreneurial thinking and behavior. Employing this concept generally leads to more innovative organizations and industries. Prior research has defined and weighted the organizational attributes that are part of the implementation of Corporate Entrepreneurship in the building industry. This study looks into the practical application of this knowledge in order to create a self-assessment for organizations with which they can find out how entrepreneurial they currently are, and what they could do on their road to improvement. The result of this study is a web tool made available to all building organizations in the Netherlands which enables them to identify their 'Corporate Entrepreneurship score'.

Keywords: tool, entrepreneurship, building industry, self-assessment, Corporate Entrepreneurship, innovation.

5.1 Introduction: a self-assessment

The objective of this study is to increase the practical usability of the results from the Fuzzy Delphi study (section 4). The result of this study is a tool which makes it possible for building organization to assess their performance on Corporate Entrepreneurship which will help them to review their current performance on stimulating innovation, and to provide insight in their strengths and weaknesses in their current effort to do increase innovation.

The input that is used in this section consists of the results from the study, using the Fuzzy Delphi Method (FDM). The validated and weighted attributes are the foundation for the tool. These attributes provide an integral overview of Corporate Entrepreneurship in the building industry, and assessing them thus creates an oversight of the Corporate Entrepreneurial performance of an organization.

Attributes

The focus of the tool is on the Corporate Entrepreneurial performance of the organization; its goal is to assess what an organization can do internally to increase its innovative performance. Therefore, the attributes are part of the environment of the organization are left out, as well as the attributes that represent the barriers to innovation. This leaves twenty-six attributes for the tool that represent the Corporate Entrepreneurial performance of the organization. The attributes are given in table 5.1.

The assessment

The assessment exists of 26 elements, called 'indicator' in the tool. These indicators represent the 26 Corporate Entrepreneurship attributes from the FDM study. The user determines for each indicator what the effort is that his/her organization puts into the indicator, and represents this effort in a score from zero to ten. The attributes are categorized in order to create a better overview for the user and in order to give more usable results. These five categories and their contributed attributes are given in table 5.1.

Table 5.1 Attributes of the tool

Category	Attributes	Weight from FDM
Category one: stimulating innovative thinking and behavior	The organization offers resources to stimulate innovative activities by members.	0.663
	Top management support.	0.730
	An entrepreneurial vision.	0.570
	The organization stimulates an entrepreneurial attitude.	0.647
	The organization offers recourses to members to perform entrepreneurial activities.	0.686
	A reward system with the right incentives.	0.612
	Offer inspiring examples.	0.612
Category two: organizational structure	The organizational structure offers room for innovation.	0.630
	The organization structure is flexible.	0.608
	The availability of experts	0.595
	Research and Development	0.599
	Reflective practitioner	0.638
Category three: organizational culture	The acceptance of mistakes.	0.641
	Conflict between members	0.500
	The organization stimulates a critical attitude of members towards the status quo.	0.628
	An entrepreneurial attitude and executing entrepreneurial activities are part of the organizational culture.	0.673
	The attitude of members to entrepreneurial activities.	0.637
	Members are stimulated to take risks.	0.580
	Stimulating contact	0.647
Category four: handling projects	The organization uses project to test and implement innovations.	0.663
	The selection process of projects takes its innovative potential into account.	0.598
	Business cases are created and are the foundation for project planning.	0.554
	Project planning incorporates time for innovative activities.	0.557
Category five: additional	The organization performs intense scanning activities.	0.663
	The organization maintains contact with its network.	0.614
	Making innovation measurable.	0.602

Scoring range

In order to make it possible for users to know where their organization stands on this zero to ten scale, an explanation is given of the extreme values of the indicator. For example, the indicator 'failure by members' has the following scoring range:

0 = Failure is not accepted and punished. There is a culture of fear surrounding failure.

10 = The organization deals with failure in a constructive way. It is mentioned and discussed, lessons learned are drawn up. People are not punished for their mistakes (neither financially nor in regard to respect and prestige).

Figure 5.1 Explanation of the scoring range in the tool

5.2 Calculations

When the user filled in the scores of all indicators, the tool will start its calculations. This is where the results from the second survey of the FDM study come into view. The calculation exists of several steps.

Step one: effort and impact

The first calculation translates the effort score, filled in by the user, to an impact score. The impact score represents the added impact of the attribute over the relative effort increase. The effort/impact calculation can follow several basic development patterns. This research uses the linear curve as a basis, extended with an exponential growth curve, an asymptotic curve, and an S-curve. This results in an impact score that can be deviant from the effect. For example, when the effort/impact curve is exponential, an effort score of 4 results in an impact score of 2.

An example to clarify:

The indicator	Making innovation measurable
Reasoning	Measuring innovation and benchmarking them is an essential activity to establish the success of an innovation. Measuring the performance on an innovation already provides a benchmark when this measuring is done without much detail, or solely on a few issues (for example: societal relevance and/or profitability). The 80/20 rule is applicable for this attribute. A bit of measuring gives results, increasing the detail-level does give an added value, but this added value diminishes when effort is high.
Curve	Exponential

The effort/impact curves are set up by the researcher is collaboration with a representative of Bouwend Nederland, the Dutch branch organization for the building industry. The explanations of the curves chosen for each attribute are given in appendix P. This appendix is in Dutch, as is the tool. This is done out of practical considerations; all users will be professionals from the Dutch building industry.

Step two: the FDM results

Now that the impact score of the indicators is determined, the next calculation is made. This step represents the results as gained from the FDM study. The FDM study has accredited weights to all the attributes (tables 4.9 and 4.10). The impact score of the attribute is multiplied by this weight. This results in a score for all attributes that represents its value for the overall Corporate Entrepreneurship performance of the organization. The FDM results used in the tool are represented in table 5.1 (weight from FDM).

An example:

The indicator	Top management support
Effort score by user	4
Effort/impact lapse	Asymptotic growth
Impact score	7

Weight from FDM	0.730
Calculation	7*0.730
Point for indicator	5.11

Step three: normalization

At the start of this step, the tool has determined the amount of points an organization receives for all its indicators. These points are now multiplied by a normalization-factor. This factor translates the total amount of points to a scale from zero to a hundred. This results in a score and a percentage that represents the Corporate Entrepreneurial performance of the organization.

Result

The calculation results in a total score for organizational entrepreneurial performance. This score is represented in the five categories of the tool, and an overall score. The results give a score in point and in percentages. The result sheet that a user receives out of the tool is pictured in figure 5.2.

The tool also offers practical advices based on the score of the user in the different categories. The score of a category falls within one of four divisions: 0-25, 25-50, 50-75, and 75-100. The user receives advice related to his score in the category.

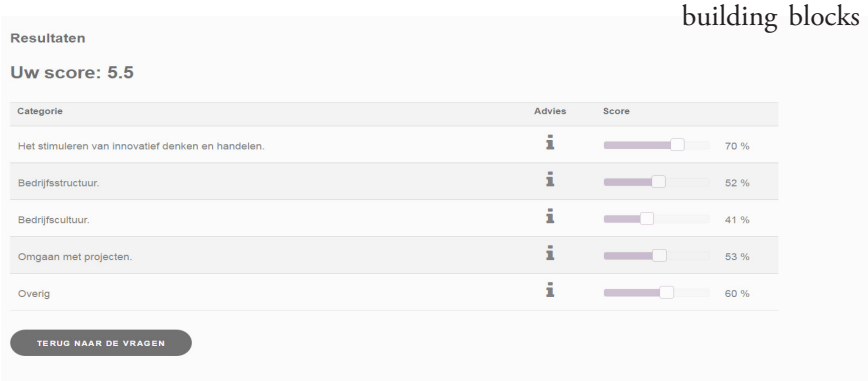


Figure 5.2 The result sheet of the tool

5.3 Use

Channel

After the first development in Excel, the tool is translated into a website. This increases accessibility and usability for users. The tool can be found on www.ondernemenindebouw.nl and through the website of Bouwend Nederland.

Guideline

In order to ensure a better understanding amongst users on how to use and apply the tool, before the user can start with scoring the indicators, an introduction page is shown that offers explanation on how the tool should be filled in. An important notion herein is that users should fill in the indicators with a critical attitude towards their own organization. They should really represent what is actually happening in their organization an avoid wishful thinking. An extensive guideline on the tool and the use of it is given in appendix P.

5.4 Conclusion

Implication for future actions

This tool offers insight in the current performance of an organization in its effort to stimulate innovative behavior amongst members. Therefore, the whole tool can be seen as an implication for future actions. Filling in the tool is just the first step; using the results and the advice that it provides is the next step that organizations will have to make. In order to establish the future actions the organization should take, several building blocks should be taken into consideration.

All these building blocks should be a part of the action plan. The building blocks are depicted in figure 5.3. The building blocks are based on experience of the researcher, information from literature on implementing Corporate Entrepreneurship, and insights gained from interviews with professionals in the building industry.

Relevance

His tool represents the practical application of this graduation research. It makes the knowledge gained by the FDM study applicable for building organizations in the Netherlands. This improves this research's relevance to practice. Moreover, the graduation company (Bouwend Nederland) now has a practical results to offer to its members.

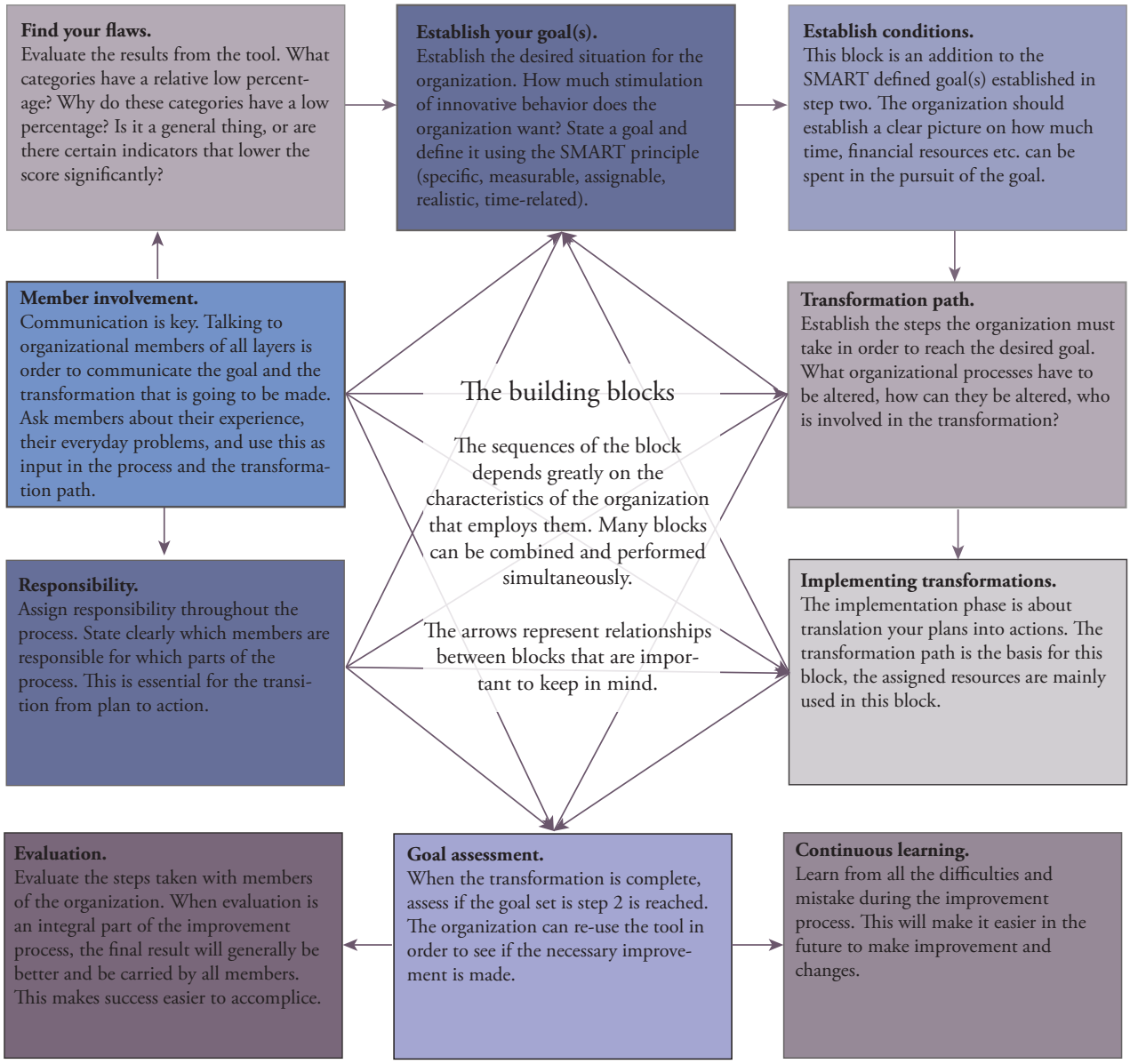


Figure 5.3 Building blocks of the process towards innovation

Bouwend Nederland will offer this tool to their members via the 'tool portal' on their website. In this portal, a diversity of other tools and information sources relevant to building organization can be found. Adding more relevant tools to this portal is part of one of the main pillars of the company; branch development. Offering relevant, practical applicable knowledge to members is one of the key point of this pillar.

In the extension of the beneficiary relevance of the tool lies the relevance for practice. When users apply this tool in their organization, it offer a new direction towards the improvement of innovative performance. That makes this tool a potential added value for all Dutch building organizations.

Discussion and recommendations

This tool offers a simplified view on the organizational processes underlying Corporate Entrepreneurship. This makes it easy to use and improves its practical value, but if also incorporates some simplifications that should be taken into consideration when using the tool. The most important notion is that this tool does not represent the full complexity of an organization and does not take into account the individual environmental and organization characteristics that will most definitely have their impact on the usability of Corporate Entrepreneurship.

A recommendation for future development of this tool is to add the possibility to gain individual advice, directed at an individual organization. Another addition would be to incorporate the interrelationships between the indicators of the tool. However, more scientific research is first needed in order to establish these interrelationships. This recommendation will be more broadly discussed in section 6.4.

Filling in the tool is just the first step; using the results and the advice that it provides is the next step that organizations will have to make. In order to establish the future actions the organization should take, several building blocks should be taken into consideration.

- Find your flaws;
- Establish your goal(s);
- Establish conditions;
- Member involvement;
- Responsibility;
- Transformation path;
- Implementing transformations;
- Evaluation;
- Goal assessment;
- Continuous learning.

6. Conclusions

6.1 The research question

In the introduction of this graduation report, one main research question has been formulated. Five sub questions help to establish a founded answer to the main research question. This chapter describes the gained insights regarding the thesis questions. After this, the scientific and beneficiary relevance of this study are discussed. This chapter ends with recommendations for future research and a discussion about the implications and limitations of this study.

SRQ 1: *What is the current state of innovation in the building industry?*

This research question is addressed in the introduction of this thesis and is dealt with in more detail in the literature study. A deficit of innovation is perceived both by academia and governments. This deficit leads to a non-optimal functioning building industry. This causes a decrease in economic performance, a lack of competitive advantage, and a high increase of prices for housing and other building when compared with other goods.

SRQ 2: *What is Corporate Entrepreneurship and what organizational and environmental attributes does it require?*

Corporate Entrepreneurship is defined as *"the presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets, or industries in order to create or sustain competitive advantage"* (Covin and Miles, 1999). The organizational and environmental attributes that it exists of are depicted in the theoretical framework that is the conclusion of the literature review. These are as follows: (1) top management support, (2) strength of cultural norms favoring Corporate Entrepreneurship, (3) strength of organizational members' pro-entrepreneurial cognition, (4) degree of organizational support for Corporate Entrepreneurship, (5) providing resources, (6) encouraging risk taking, (7) availability of experts, (8) reward system, (9) scanning intensity, (10) network capacity, and (11) entrepreneurial vision and strategy. The complete framework on Corporate Entrepreneurship is given in figure 3.7.

SRQ 3a: *Can Corporate Entrepreneurship be used in the building industry?*

SRQ 3b: *What makes the building industry different than other industries that employ Corporate Entrepreneurship?*

The literature review provides an answer to the first part of this question, the FDM study validates this answer and answers the second part of this question. Firstly, Corporate Entrepreneurship can be used in the building industry. This is founded on (1) literature that states that project based firms are a compatible match with Corporate Entrepreneurship, and the building industry is project based. (2) Literature on ways to increase innovation in the building industry and the proposed method to enhance innovation by employing Corporate Entrepreneurship have great overlaps. (3) The industry characteristics make it a suitable match with Corporate Entrepreneurship (its business risk character, and the need to increase competitive advantage). The usefulness of Corporate Entrepreneurship for the building industry is also supported by the outcome of the Fuzzy Delphi study. In this study, attributes that where part of the Corporate Entrepreneurship concept were valued high by experts as means to increase innovation in the building industry (see table 4.9).

When it comes to question 3b; the building industry has its overlaps with other industries, but it also has some differences. These differences come to light in the evaluated hypotheses in part four. Attributes as 'the support of risk taking' , 'the acceptance of failure', 'an entrepreneurial vision', and 'increasing R&D activities' are all valued highly when looking at Corporate Entrepreneurship in other industries. However, these attributes get a low rating by experts from the building industry. Section 4.5.1 explains where these deviations may come from.

SRQ 4: *Which attributes are the most influential when employing Corporate Entrepreneurship in the building industry?*

This question is answered based on the results from the second survey of the Fuzzy Delphi study. This questionnaire asked respondents to score attributes, with as a result a weight for each attribute and thus their ranking. The weights of attributes can be found in table 4.9 and appendix N.

The ten most influential innovation enhancers are: (1) top management support, (2) the organization offers resources to members to employ entrepreneurial activities, (3) entrepreneurial attitude and performance of entrepreneurial activities are part of the organizational culture, (4) the organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge), (5) the organization uses projects to test and implement innovations, (6) the organization performs intense scanning activities, (7) the organization stimulates and encourages its members to act entrepreneurial, (8) the organization stimulates contact between generations; new, experiences, young, and old employees, (9) the organization accepts mistakes from its members, and (10) constant education of new and experienced employees (the reflective practitioner).

The Fuzzy Delphi study also identified the top innovation barriers; reasons why innovation in the building industry lacks behind. The identified barriers are: (1) traditional contract forms, (2) limited investment in research, (3) the fragmented nature of the building industry, (4) the role of the client, (4) the industry has a low perceived innovation-drive level, (6) restrictions by laws and regulations, (7) the market structure, and finally (8) lack of recognition, promotion, and reward of creativity, quality of work, and innovation.

Corporate Entrepreneurship can be used in the building industry. This is founded on (1) literature that states that project based firms are a compatible match with Corporate Entrepreneurship, and the building industry is project based. (2) Literature on ways to increase innovation in the building industry and the proposed method to enhance innovation by employing Corporate Entrepreneurship have great overlaps. (3) The industry characteristics make it a suitable match with Corporate Entrepreneurship (its business risk character, and the need to increase competitive advantage).

SRQ 5: *How can an organization in the building industry employ Corporate Entrepreneurship in order to enhance its innovativeness?*

Several of the recommended actions that organizations can take are mentioned in section 4.5.2. Examples of recommendations are 'ensure top management support', 'provide resources to members' and 'create an entrepreneurial culture'. However, this is not a complete overview of how an organization can employ the Corporate Entrepreneurial concept to its own advantage. In order to provide organizations with a helping hand that gives them insight in the employment of Corporate Entrepreneurship to better their innovative performance, a tool is constructed. This tool is converted into the website www.ondernemenindebouw.nl. The tool provides people with the opportunity to evaluate their current performance in innovative entrepreneurship, and to assess their road ahead. More information and elaboration on this tool is given in part 5 of this report.

RQ: *Can the Corporate Entrepreneurship concept be used to increase the innovativeness of the Dutch building industry?*

The main research question of this study can be answered by combining the answers of the sub questions one to five. This study shows that the Corporate Entrepreneurship concept, and its attributes, will be beneficial for the building industry. Experts confirmed that the attributes from Corporate Entrepreneurship will increase the innovative performance of a building organization. Literature shows the ability to connect the characteristics of the building industry with Corporate Entrepreneurship. All in all; Corporate Entrepreneurship will have a beneficial effect on innovation in the building industry. The more innovation, the higher the competitive advantage of Dutch building firms, the higher their revenue, the more people they can hire, the more benefits there are for the general economy, and the cheaper housing and buildings will become.

The main objective of this study was to create an attribute framework that depicts how Corporate Entrepreneurship works in the Dutch building industry. The theoretical framework defines an attribute list that was validated in the first survey of the Fuzzy Delphi study. Weights were attributed in the second survey. This results in a validated and supported attribute framework on Corporate Entrepreneurship in the Dutch building industry. This framework is given in figure 6.1.

In total, 31 experts validated the framework, 21 experts weighted the attributes in the second survey, 3 interviewees offered support and background information, and one professional from Bouwend Nederland created the hypotheses.

6.2 Relevance

Scientific relevance

The concept of Corporate Entrepreneurship has an increasing attraction to many scientists and organizations. Many innovative industries use it to determine their road ahead on the innovative path, and use its attributes to create an innovative and entrepreneurial environment within their organization that boost their overall performance.

In regard to a more traditional industry, such as the building industry, no research was performed yet. Some exploratory studies pointed out that there might be a beneficiary relationship between Corporate Entrepreneurship and the building industry, but this was not elaborated with actual proof.

In this, the study is the first of its kind. It is the first study to not only write about the possible benefits of

Corporate Entrepreneurship in the building industry, but does also develops a theoretical framework about this (the literature review) and provides evidence that support this framework (the Fuzzy Delphi study).

The results of this study make it relevant for the scientific community because it is first of its kind. It shows that Corporate Entrepreneurship could be beneficial to the Dutch building industry and thus provides a new approach towards the improvement of innovation in the building industry.

It does not only contribute to current scientific knowledge about the building industry, but also to the scientific community of Corporate Entrepreneurship. There is still a lot to investigate, and this study shows a new way to do this, by using the Fuzzy Delphi Method to actually rank attributes. This is not done before. Furthermore, it elaborates more on the literature available about Corporate Entrepreneurship in project based firms, since it offers an example of how this could work, and what extra considerations should be taken into account.

This study leaves a lot of open ends; it is a pioneering study in some way, and thus needs a lot of elaboration and more research from other academia.

Beneficiary relevance

The beneficiary of this study is the Dutch association for builders 'Bouwend Nederland'. This organization has as objective to lobby for the interests of building organizations, to provide benefits for their members, and to support industry development. This study has relevance on several of these core activities. Firstly, lobbying. This study can help to develop the lobbying standpoint of the organization when it comes to entrepreneurship and innovation. The barriers that occur from this research, can be used to expresses the discontent of the industry about certain governmental

This study shows that the Corporate Entrepreneurship concept, and its attributes, will be beneficial for the building industry. Experts confirmed that the attributes from Corporate Entrepreneurship will increase the innovative performance of a building organization. Literature shows the ability to connect the characteristics of the building industry with Corporate Entrepreneurship. All in all; Corporate Entrepreneurship will have a beneficial effect on innovation in the building industry.

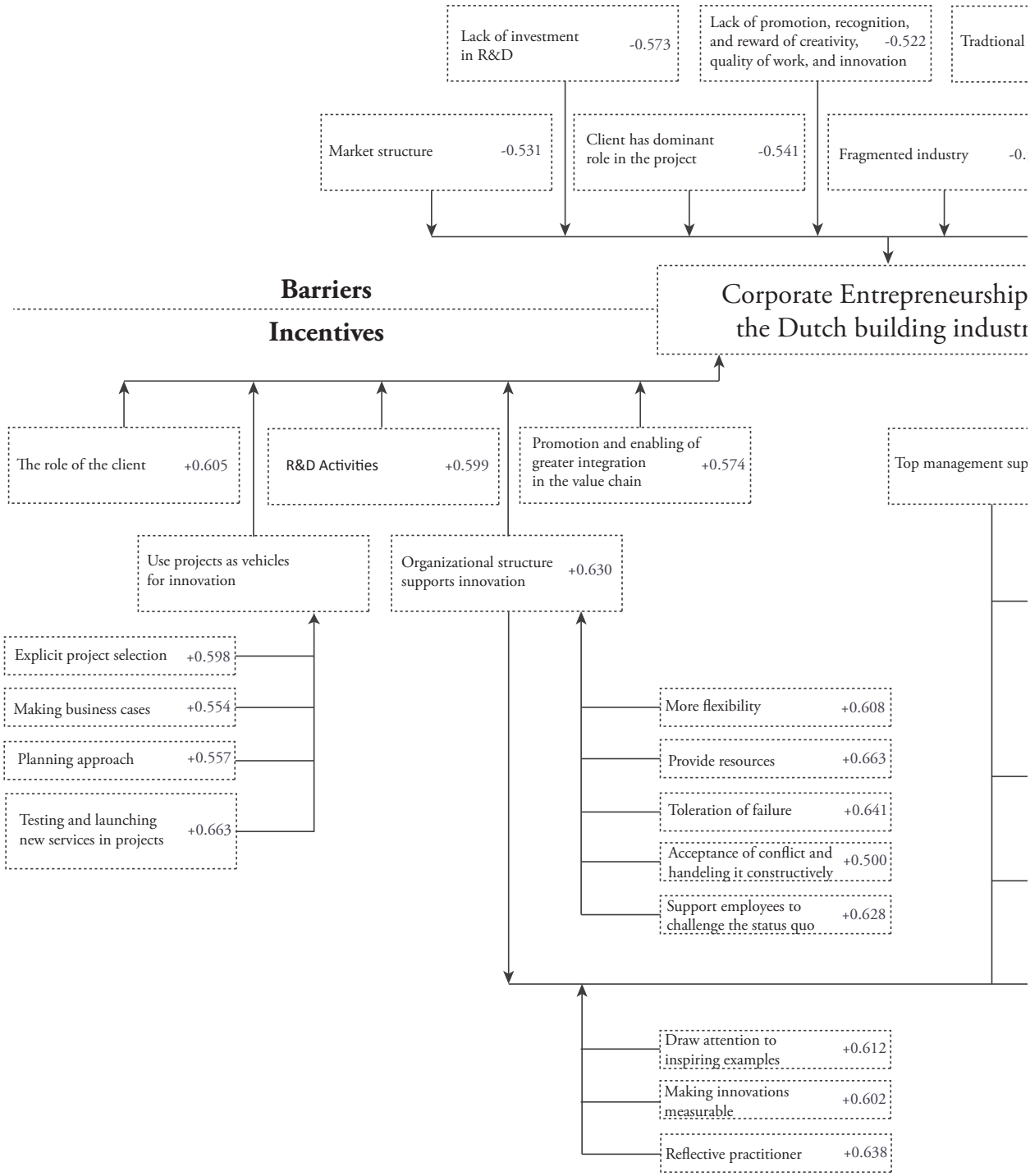
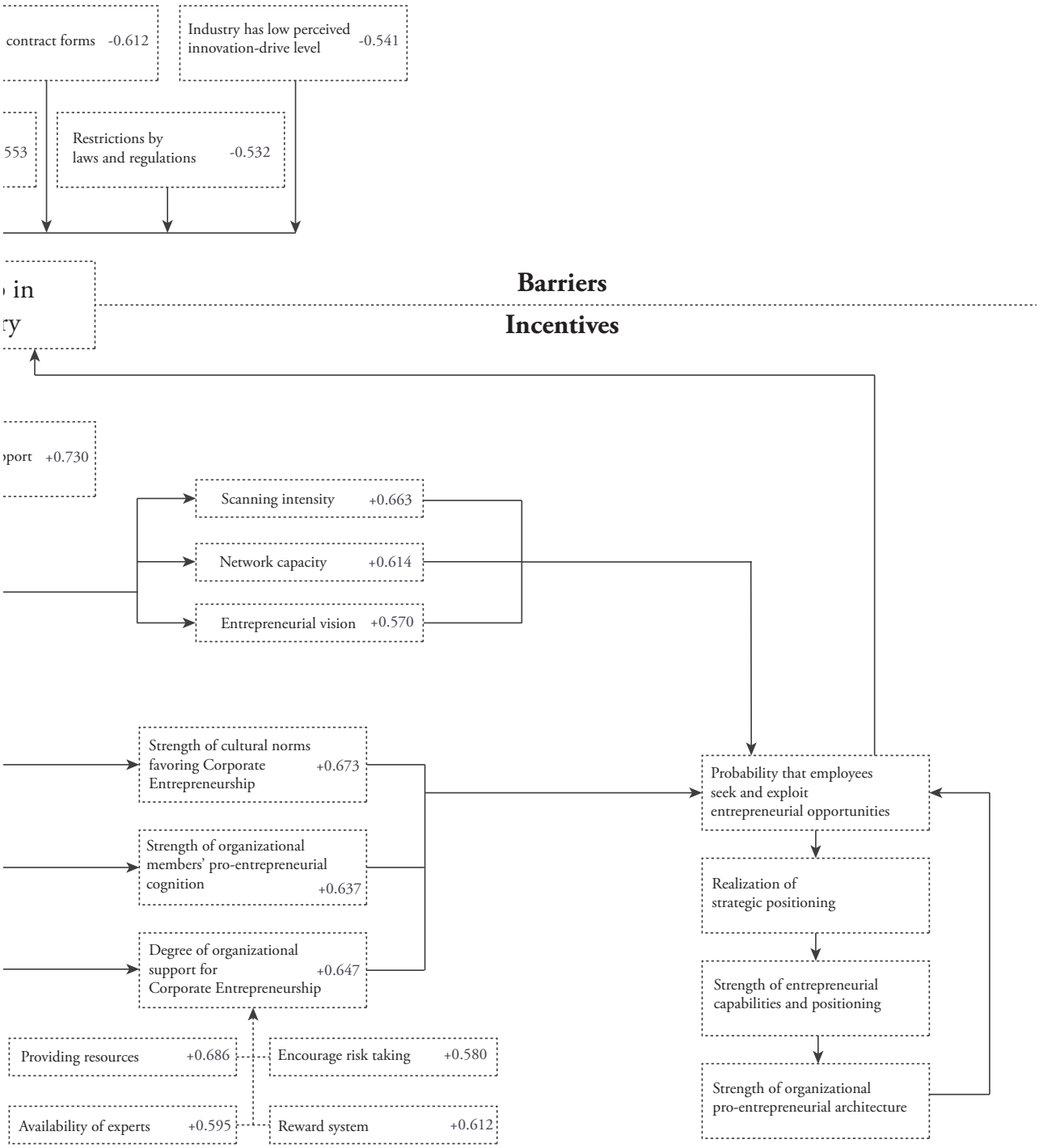


Figure 6.1 Corporate Entrepreneurship in the Dutch building industry: an attribute framework


contract forms -0.612
Industry has low perceived innovation-drive level -0.541
553
Restrictions by laws and regulations -0.532
in
ry
Barriers
Incentives
port +0.730
Scanning intensity +0.663
Network capacity +0.614
Entrepreneurial vision +0.570
Strength of cultural norms favoring Corporate Entrepreneurship +0.673
Strength of organizational members' pro-entrepreneurial cognition +0.637
Degree of organizational support for Corporate Entrepreneurship +0.647
Providing resources +0.686
Encourage risk taking +0.580
Availability of experts +0.595
Reward system +0.612
Probability that employees seek and exploit entrepreneurial opportunities
Realization of strategic positioning
Strength of entrepreneurial capabilities and positioning
Strength of organizational pro-entrepreneurial architecture

issues such as laws and regulations. It can also help to express the support the government should offer to the industry.

Perhaps the most obvious relevance of this study for the organization is related to its core activity of 'industry development'. Bouwend Nederland wants to offer relevant information to its members in the field of the industry, current issues, and new developments. This study provides information that is useful to building organizations, and thus to Bouwend Nederland.

From the perspective of the beneficiary, the most important results of this study is the tool and the ranking of attributes. The ranking of attributes provides relevant content to the members, and thus adds value to the membership. The tool is a practical model that provides a quick insight in the functioning of the own organization and the possible roads to improvement. The tool is of added value to Bouwend Nederland's current web service that include already several other self-assessment tools such as the 'MVO zelfscan'. Some tools offered on the website are exclusive for members, some are accessible for all interested parties. The tool of the project falls in the second category and will be available to all who are interested. When members use this tool, it will generate interest by some in how they can improve their organizational performance on Corporate Entrepreneurship. In some cases this will lead to a conversation with Bouwend Nederland, with questions and for advice. Contact moment with (potential) members is always valuable for Bouwend Nederland.

Practical relevance

In extension to the relevance towards the beneficiary, the results of this study, in particular the tool, offer value to all building organization in the Netherlands. The beneficiary is the representative of them, so the relevance towards them is relevance towards the industry. Building organizations can employ the Corporate Entrepreneurship tool to improve their organizational performance on innovation and to locate improvement points. The tool will help them to self-asses their current situation and to find out what they can do in the future. The results of the FDM study, combined with the tool show which organizational attributes should play a central role in their strategy and innovation-roadmap.

Societal relevance

As described in the introduction of this thesis, increasing innovation in the building industry has benefits on several levels. Two of these levels show the societal relevance of this study. By increase innovativeness, the industry performs better and will provide more economic value. This is beneficiary to society as a whole. The more direct societal relevance lies on the level of consumer, or end-user. Increasing innovation in the industry, will lead to buildings that are more in accordance with what people want and need. Innovation will decrease cost of building, and thus lower prices of housing. This is beneficiary for almost all people in a society, since almost all either have a home, stay in a building, and/or work in one.

This research tends to find a general way to increase innovation by establishing corporate attributes that will increase innovative performance. Employing the approach as offered by this study, building firms will enhance their innovativeness and thus create a better product for all its users.

6.3 Future research

This study leaves several open ends for future academia to research. Several of these have already been mentioned in the report. The most important recommendations for future research are;

1: The generalization of finding

Obtaining more knowledge about the specifics of employing Corporate Entrepreneurship in a project based setting. This study is a fair start for this, however more research is needed in order to find out how

expandable the results are towards other countries and other (related) industries. Also, the experts who took part in the FDM study are all employed in large building organizations. Therefore, more research should establish whether results could be translated to smaller building organizations.

2: Interrelationships
The interrelationships of attributes evaluated in the Fuzzy Delphi study is a notion for future research. These interrelationship and their direction and value will result in a more elaborated understanding of how Corporate Entrepreneurship works in a complex environment such as a building organization.

6.4 Discussion

There are several limitations that should be taken into consideration in the perspective of this study. An important limitation is the ambiguity of concept. As mentioned in the literature review, consensus is yet to be reached on the exact definition of Corporate Entrepreneurship. The attributes belonging to it are also subject to interpretation. Many of the attribute investigated in this study are open for interpretation. This make it possible that different expert have in fact evaluated different thing when scoring the same attribute.

For example; the attribute 'providing resources to perform entrepreneurial activities' can be interpreted in various ways. Entrepreneurship to some might be the establishment of a new firm, while other will also see it as an attitude. This will result in different answers.

The tool is a practical model that provides a quick insight in the functioning of the own organization and the possible roads to improvement. [..] When members use this tool, it will generate interest by some in how they can improve their organizational performance on Corporate Entrepreneurship. In some cases this will lead to a conversation with Bouwend Nederland, with questions and for advice. Contact moment with (potential) members is always valuable for Bouwend Nederland.

Changing opinion of experts

Other limitation are subject to the employed research method. The fuzzy Delphi method makes it possible for respondent to alter their opinion about an attribute based on the responses of other experts. Analyzing the changing responses is an important part of the discussion on the FDM study, since it shows how consequent respondents are in their opinion, and how much they are influenced by the opinion of others.

The first questionnaire gives the option to choose 'no effect' for an attribute. When answering consequently, the attributes should also score a zero or a low effect score in the second questionnaire. At first glans, there seems to be a large deviation between these two questionnaires; there are a lot of 'no effect' answers in the first survey, though no zero scores in the second survey. A closer look is necessary to establish where this large shift in general opinion comes from.

The first part of the explanation of this shift is due to the loss of experts between the first and second survey. In the first survey, 31 experts participate. Due to job changes, lack of time and retirement the second questionnaire is answered by 21 experts. This explains over half of the 'no effect answers', because they were given by the group of drop-outs that did not participate in the second questionnaires. This might indicate that the residual experts are more positive than the dropout where. This is an important notion. Experts who have a more positive outlook on innovation might easier take part in a study about this topic. Is that is the case, the answers of this study are more positive than when the study had included other expert groups. This is an important impression that should be taken into consideration in future research on this topic.

A closer look shows that the largest percentage of 'no effect' answers in the first survey are given for attribute 5 'conflict between members is accepted and dealt with constructively'. We can see that this variable is also evaluated quit low in the second questionnaire with a crisp value of 0.500. Another attribute that gets a lot of the 'no effect' answers is attribute 9 'Business cases are created and are the foundation for project planning'. This attribute also end up at the bottom of the ranking in the second questionnaire (on place twenty seven) with a crisp value of 0.554. In general respondents do alter their 'no effect' opinion of the first questionnaire to a low to medium scoring in the second questionnaire. Many will be influenced by the response report that was provided with the second survey that showed the response from the first survey.

The changing perspective of experts also is dependent on the moment. Whether they have a bad day or be in a good mood will affect their answers. When their innovative idea has just been deemed 'not going to happen' by their chief, there answers will be different than when they just had a positive reaction. A change in top management of an organization (as was the case for several of the participants who all work in the same organization) might also influence their opinion because this might include a renewed organizational vision, or a change in culture. It can also make it seem easier to express your own feelings and opinions when a restricting supervisor is gone. This is a point for further investigation; how does the momentary environment of the expert influence his/her answers.

Cause and effect

As an addition to this research discussion, the notion of an interrelationships model is investigated. The importance of an interrelationshipsmodel of the attributes is already discussed in this report. In short; it will give a more complete overview on how Corporate Entrepreneurship will work in a complex environment such as a building organization. In discussing the results from this study, reviewing on how such an interrelationshipsmodel could look like, is an important addition to the results from the FDM study (see section four) and the tool (see section five).

There is a very limited amount of research available on interrelationships between attributes of the Corporate Entrepreneurship concept. Prior research does offer an inside look on which attributes are related to each other and also offers knowledge on the direction of this relationship (positive or negative). This information can be used to construct a cause-effect model, a basic version of an interrelationshipsmodel that depict the influences attributes have on each other. The cause-effect model will include the attributes that have information on their interrelationships and the direction of these relationships. The attributes that are part of the cause-effect model are depicted in table 6.1.

The relationships between attributes are investigated as part of the Literature Review. This research results in an overview of relationships between attributes. These are depicted in table 6.1. The individual weight of attributes are also known since they are the result from the FDM study. These weights are also added in table 6.1.

The literature review shows that all these attributes have a positive influence on their successor (the attribute they have an influence on). All this information combined gives the cause-effect model for Corporate Entrepreneurship in a building organization, depicted in figure 6.2.

For future research it is recommended that this cause-effect model is further expanded and elaborated in order to gain a better understanding of the application of Corporate Entrepreneurship in the complex environment of the building industry.

The changing perspective of experts also is dependent on the moment. Whether they have a bad day or be in a good mood will affect their answers. When their innovative idea has just been deemed 'not going to happen' by their chief, there answers will be different than when they just had a positive reaction. A change in top management of an organization (as was the case for several of the participants who all work in the same organization) might also influence their opinion because this might include a renewed organizational vision, or a change in culture.

Table 6.1 The attributes of the cause-effect model

ID	Attribute	Weight	Influences (ID)
1	Top management support	0.730	3,6,11,12,14,23
2	The organization offers recourses to members to employ entrepreneurial activities	0.686	12
3	Entrepreneurial attitude and performance of entrepreneurial activities are part of the organizational culture	0.673	-
4	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge)	0.663	12
5	The organization uses projects to test and implement innovations	0.663	-
6	The organization performs intensive scanning activities	0.663	-
7	The organization stimulates and encourages its members to act entrepreneurial	0.647	12
8	Stimulate contact between generations; new, experiences, young and old employees	0.647	7
9	The organization accepts mistakes from its members	0.641	7
10	Constant education of new and experiences employees (reflective practitioner)	0.638	-
11	Employees are attracted to entrepreneurial activities	0.637	-
12	The organizational structure is arranged in a fashion that creates room for innovation	0.630	-
13	The organization stimulates a critical attitude from members towards the status quo	0.628	7
14	The organization maintains contact with its network	0.614	-
15	The reward system takes into account the innovativeness and entrepreneurial activities of an employee	0.612	7
16	Draw attention to inspiring examples	0.612	-
17	Flexibility in the organization structure (in space, planning, finance etc.)	0.608	12
18	Making innovation measurable	0.602	-
19	Research and Development activities	0.599	12
20	The selection process if projects takes its innovative potential into account	0.598	5
21	Experts offer relevant knowledge to organizational members	0.595	12
22	Members are stimulated to take risks	0.580	7
23	An entrepreneurial vision	0.570	16
24	Project planning incorporates time for innovative activities	0.557	5
25	Business cases are created and are the foundation for project planning	0.554	5
26	Conflict between members are accepted and dealt with constructively	0.500	7

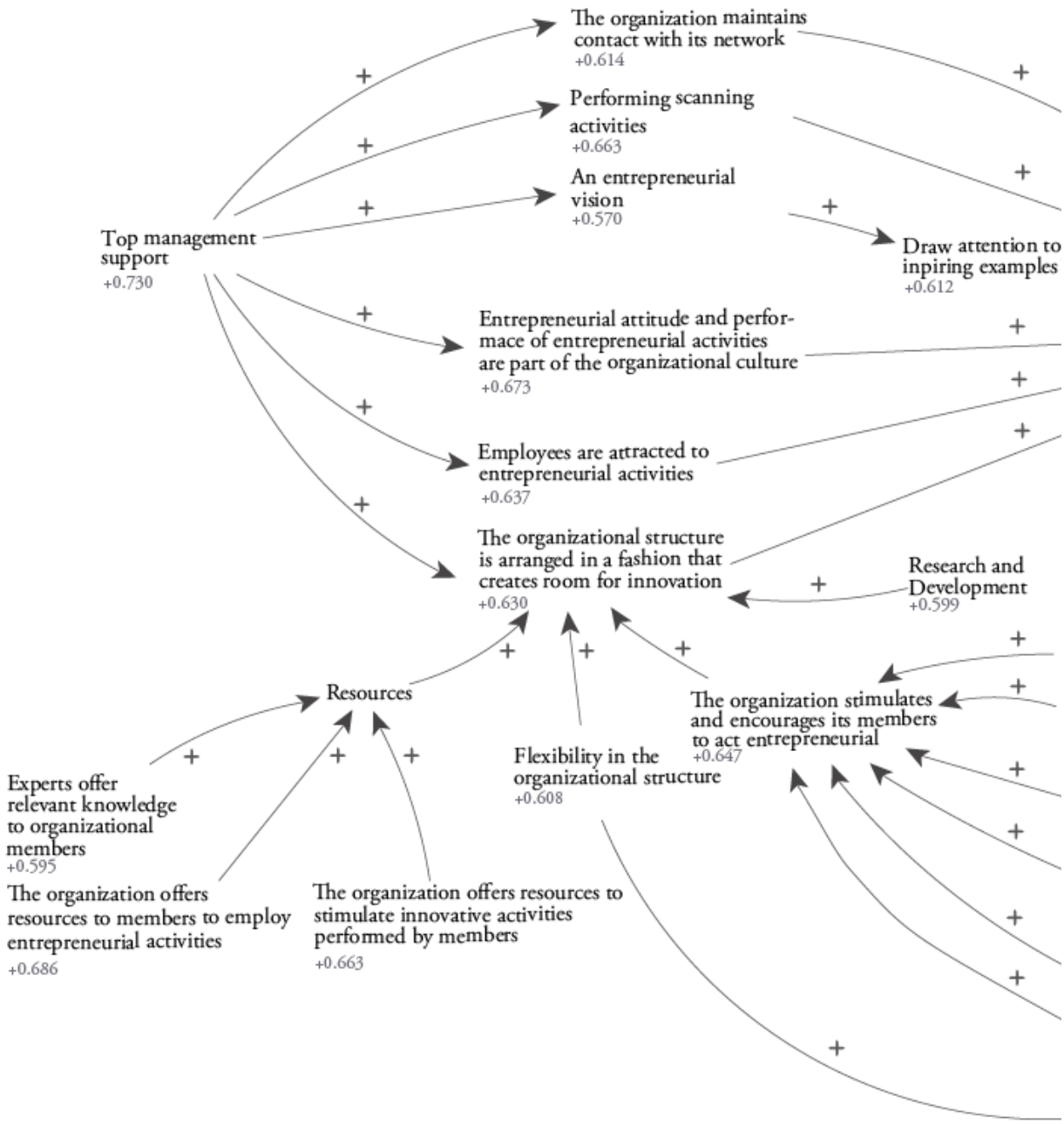
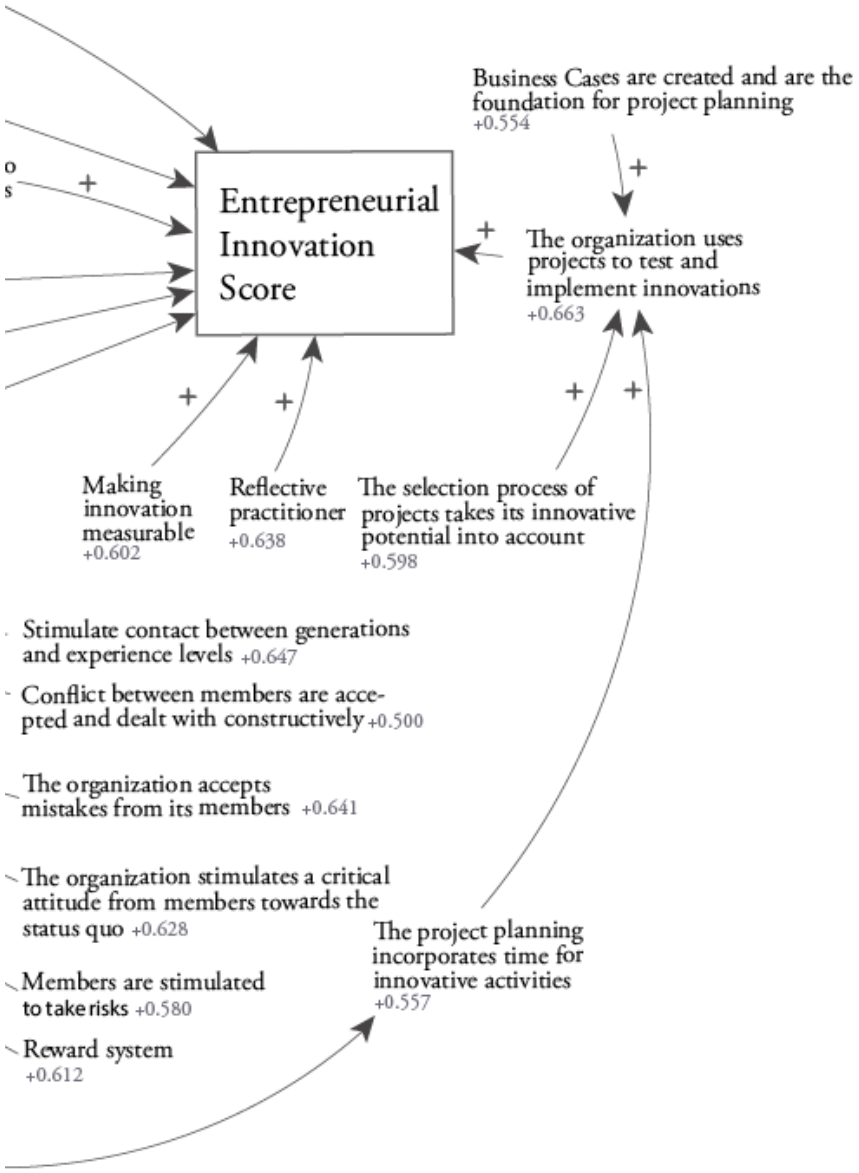


Figure 6.2 The cause-effect model


Business Cases are created and are the foundation for project planning +0.554
Entrepreneurial Innovation Score
The organization uses projects to test and implement innovations +0.663
Making innovation measurable +0.602
Reflective practitioner +0.638
The selection process of projects takes its innovative potential into account +0.598
Stimulate contact between generations and experience levels +0.647
Conflict between members are accepted and dealt with constructively +0.500
The organization accepts mistakes from its members +0.641
The organization stimulates a critical attitude from members towards the status quo +0.628
Members are stimulated to take risks +0.580
Reward system +0.612
The project planning incorporates time for innovative activities +0.557

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Appendix A Definition list

A

Ambidexterity – Simultaneous performing exploitation activities and exploration activities.

ANOVA test – The analysis of variance; analyses the differences amongst group means and their associated procedures.

B

Building industry – Sector of industry that engages in building, alteration and repair of buildings. Includes different actors in the initiative, design, building, operation, and demolishing phase.

Business Model - The business model is a description of the completeness and the consistency of how a company creates, delivers, and retains value and the consequences it carriers for the internal organization.

Business Model Canvas – A management that tool describes how an organization intents to maintain itself. The canvas is about the customer (on the right), the value proposition (in the middle), the infrastructure (on the left), and the financial viability (on the bottom)

C

Causal loop diagram – This diagram explains the behavior of a system by showing a collection of connected nodes and the feedback loops created by the connections. One or more of the nodes represent the symptoms of the problem. The rest of the nodes are the causal chains causing the problem.

Competitive advantage – An advantage gained by an organization when it can offer a better customer value (example: same value lower price; higher value by differentiation).

Construction industry – Sector of industry that engages in preparation of land and construction, alteration and repair of buildings, structures, and other real property.

Contextual ambidexterity – Nurturing an appropriate organizational context that combines stretch, discipline, support and trust. The activities should be maintained simultaneously at any given organizational level. Cultural values that promote innovation coexist with values of quality and efficiency.

Corporate Entrepreneurship – The presence of innovation plus the presence of the objective of rejuvenating or purposefully redefining organizations, markets or industries in order to create or sustain competitive superiority.

Creative destruction – The act of creating new product, services, or processes that destroy their predecessors.

Crisp Value – The crisp value is the calculated evaluation score of an attribute. This study calculates the crisp value in accordance with the Fuzzy Delphi Methodology.

D

Decision Support System – Computer system designed to provide assistance in determining and evaluating alternative courses of action. A DSS acquires data from the mass of routine transactions in a form, analyzes it with advanced statistical techniques to extract meaningful information, and narrows down the range of choices by applying rules based on decision theory.

Delphi method – A research approach develop as a forecasting method that uses a panel of experts to construct its answers.

Demand uncertainty – The demand uncertainty of an industry arises from the uncertainty associated with customer preferences. The more unknowns there are in this area, the higher the 'demand uncertainty' score on the scale.

Domain redefinition – The creation and exploitation of a new-previously unoccupied product/market arena.

Domain separation – Basic assumption that exploration and exploitation can be carried out in multiple domains. The goals is to achieve overall balance with alliances. Three types of alliances: value-chain function, network structure and partner attributes.

E

Entrepreneurship – Although traditionally mainly defined as 'starting a new venture', it is also a certain attitude that incorporates innovation, risk taking and initiative.

Expert – An experts is a person who possesses certain skills and/or knowledge that is superior to the knowledge/skills of the vast majority of people.

F

Fuzzy Delphi Method – Research methodology that relies on a panel of experts to evaluate and score a pre-defined list of attributes with the objective of ranking and weighing these attributes.

Fuzziness – Vagueness resulting from a lack of definite or sharp distinctions.

G

H

I

Individual network capacity – An individual's skill at locating and securing cooperation from organizational members in order to access their knowledge.

Innovation – Innovation is the actual use of a nontrivial change and improvement in a process, product, or system that is novel to the institution developing the change.

J

K

L

Literature review – A literature review describes relevant prior literature in the main research topic and related areas.

Locus of planning – The depth of employee involvement in a company's strategic planning activities.

M

Market structure – The interconnected characteristics of a market, such as the strength of buyers and sellers. There are four basic types: (1) perfect competition, (2) oligopoly, (3) monopoly, and (4) monopsony.

Monopoly – Type of market structure. Single seller with considerable control over supply and prices.

Monopsony – Type of market structure. Single buyer with considerable control over demand and prices.

N

O

Oligopoly – Type of market structure. Several large sellers who have some control over the prices.

Organizational culture – The values and behaviors that contribute to the unique social and psychological environment of an organization.

Organizational network capacity – The willingness of employees to contribute and the ease through which the organization van navigate in order to those with situation-specific knowledge.

Organizational rejuvenation – A major, internally focused innovation aimed at improving firm functioning or strategy implementation.

Organizational separation – Exploitative units are larger and more centralized, with tight cultures that focus on maximizing efficiency and control through process management. Exploratory units are designed to generate innovation through experimentation, small and decentralized.

Organizational structure – The hierarchical arrangement of lines of authority, communications, rights and duties of an organization. It determines how roles and responsibilities are assigned, controlled and coordinated, and how information flows through the organization.

P

Perfect competition – Type of market structure. Many buyers and sellers, none being able to influence prices.

Planning flexibility – The capacity of an organization's strategy to change and adept when opportunities or threats appear from the environment.

Program network capacity – Refers to the level of recognition and acceptance about the importance of the program as the key to success.

Project – Projects are temporary organizations involving teams of individuals from within a single firm or from multiple firms. A project performs a time-sequenced set of interdependent activities to achieve pre-defined goals or conform to specifications. Projects are initiated to accomplish tasks that do not occur sufficiently often to warrant the establishment of an enduring organization.

Project Based industry – An industry that performs its main activities via projects (see definition of 'project').

Q

R

Resources – A source or supply from which benefit is produced. For example; time, money, knowledge, material, energy, staff.

Research and Development – Systematic activity combining both basic and applied research, and aimed at discovering solutions to problems or creating new goods and knowledge. It may result in ownership of intellectual property such as patens.

S

Scanning intensity – The managerial activity of learning about trends and events in the environment of the organization.

Stock and flow diagram – The stock and flow diagram is a way to describe dynamic behavior. This principle states that all dynamic behavior in the world occurs when flows accumulates in stocks. A stock and flow diagram is a depiction of this phenomenon.

Strategic controls – The organization's capability of rewarding creativity and the pursuit of opportunity through innovation.

Strategic renewal – The pursuit of a new strategic direction.

Strategy – A method chosen to reach the desired vision of the organization.

Sustained regeneration – A new product introduction or the entrance to a new (to the firm) but existing market.

System Dynamics – A methodology and computer simulation modelling technique for framing, understanding, and discussing complex issues and problems.

T

Technological uncertainty – Technological uncertainty result from unknown developments regarding technologies that might emerge or be combined with existing technology in order to create a new product or service.

Temporal separation – Involves cycles of exploration and exploitation, during which an organization focusses only on one dominant activity and later shifts to the other.

Top management – The highest ranking executives responsible for the entire organization. To management translates the policy into goals, objectives, strategy, and vision.

U

V

Vision – The desired achievement of an organization in the mid-term or long-term future.

W
X
Y
Z

Appendix B Attribute list after literature review

Attributes that influence the successful integration of Corporate Entrepreneurship in an organization

Attribute category	Attribute	Arena	Author(s)
Corporate Entrepreneurship	Top management support	Organization	Ireland, Covin and Kuratko, 2009; Kuratko, Ireland and Hornsby, 2001; Martin-Rojas, Garcia-Morales, and Bolivar-Ramos, 2013
	Entrepreneurial strategy	Organization	Ireland, Covin and Kuratko, 2009; Barringer and Bluedorn, 1999
	Entrepreneurial vision	Organization	Kuratko, Ireland, and Hornsby, 2001
	Cultural norms that favor entrepreneurial behavior of organizational members	Organization	Ireland, Covin and Kuratko, 2009
	Employees entrepreneurial cognition	Organization	Barringer and Bluedorn, 1999; Ireland, Covin and Kuratko, 2009
	Encouraging reward system	Organization	Ireland, Covin, and Kuratko, 2009; Kuratko, Ireland, and Hornsby, 2001
	Organization encourages risk taking by members	Organization	Kuratko, Ireland, and Hornsby, 2001
	Intensity of competition	Environment	Ireland, Covin, and Kuratko, 2009
	Rapidity of technological change	Environment	Ireland, Covin, and Kuratko, 2009
	Extensiveness of the product-market domain	Environment	Ireland, Covin, and Kuratko, 2009
	Communication with the environment when searching entrepreneurial opportunities; scanning intensity; The managerial activity of learning about trends and events in the environment of the organization	Organization and environment	Barringer and Bluedorn, 1999

Attributes that decrease the innovativeness of the building industry

Attribute category	Attribute	Arena	Author(s)
Building industry	Project based character	Industry	Davidson, 2013; Dulaimi, Ling, Ofori and de Silva, 2002; Miozzo and Dewick, 2005 Winch, 1998
	Multi participant character of projects	Industry	Gumilar, Zarnic, and Selih, 2011
	Small to medium size of project members	Industry	Gumilar, Zarnic, and Selih, 2011
	Fragmented industry	Industry	Gumilar, Zarnic, and Selih, 2011
	Dependency of general economic conditions	Industry	Gumilar, Zarnic, and Selih, 2011
	Client has dominant role in the outcome	Industry	Gumilar, Zarnic, and Selih, 2011; Blayse and Manley, 2004; Gambatese and Hallowell, 2011; Winch, 1998
	The industry has a low perceived innovation-drive level	Industry	Gumilar, Zarnic, and Selih, 2011
	Market structure	Industry	de Bruijn and Maas, 2005
	Teams change between projects, resulting in a lack of trust	Industry	de Bruijn and Maas, 2005
	Teams change between projects, resulting in an absence of knowledge exchange	Industry	de Bruijn and Maas, 2005
	Teams change between projects, resulting in a situation that all members try to avoid full responsibility	Industry	Winch, 1998
	The project based character of the industry results in the situation that innovation that occurs in one project in not implemented in the next	Industry	Miozzo and Dewick, 2005
	Projects are fully predefined by a set of detailed prescripts that leave little room for innovation	Industry	de Bruijn and Maas, 2005
	Lack of investment in Research and Development	Industry	Blayse and Manley, 2004; Dulaimi et al. 2002; Winch, 1998
	The lack of co-ordination between academia and industry in research activities	Industry	Blayse and Manley, 2004; Dulaimi et al. 2002; Winch, 1998
	Lack of promotion, recognition, and reward of creativity, quality of work, and innovation	Industry	Dulaimi et al. 2002
	Form of contract	Industry	Ling, 2003
	Cost of carrying out research	Industry	Ling, 2003
	Lack of information on cost savings arising from the innovation	Industry	Ling, 2003
	Restrictions imposed by regulations	Industry	Ling, 2003

Attributes that will increase innovativeness of the building industry

Attribute category	Attribute	Arena	Author(s)
Building industry	Influence of a client on the innovativeness of a project	Industry	Blayse and Manley, 2004; Gambatese and Hallowell, 2011; Winch, 1998
	Promotion and enabling of greater integration across the value chain	Industry	Blayse and Manley, 2004; Dulaimi et al, 2002; Ling, 2003
	Supporting and encouraging employees to question the status quo	Building organization	Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Ling, 2003
	Toleration of unsuccessful ideas	Building organization	Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Ling, 2003
	Acceptance of conflict and handling it constructive	Building organization	Blayse and Manley, 2004; Dulaimi et al., 2002; Gambatese and Hallowell, 2011; Hartmann, 2006; Ling, 2003
	Providing resources that enable innovation	Building organization	Ling, 2003
	Organizational structure that enables innovation activities	Building organization	Gambatese and Hallowell, 2011; Hartmann, 2006; Winch, 1998
	Research and Development activities	Building organization	Dulaimi et al., 2002
	Organization should offer more flexibility and thus create an environment suited for the pursuit of innovation	Building organization	Ling, 2003; Winch, 1998

Attributes that influence the success of Corporate Entrepreneurship in Project Based firms.

Attribute category	Attribute	Arena	Author(s)
Project based firms	Top management support	Building organization	Blindenback-Driessen and van den Ende, 2006
	Application of contingent planning approaches	Building organization	Blindenback-Driessen and van den Ende, 2006
	Explicit project selection	Building organization	Blindenback-Driessen and van den Ende, 2006
	Availability of experts	Building organization	Blindenback-Driessen and van den Ende, 2006
	Making business cases	Building organization	Blindenback-Driessen and van den Ende, 2006
	Testing and launching new services	Building organization	Blindenback-Driessen and van den Ende, 2006

Appendix C Subsystems of the theoretical model

Figure 1: the theoretical subsystem of Corporate Entrepreneurship

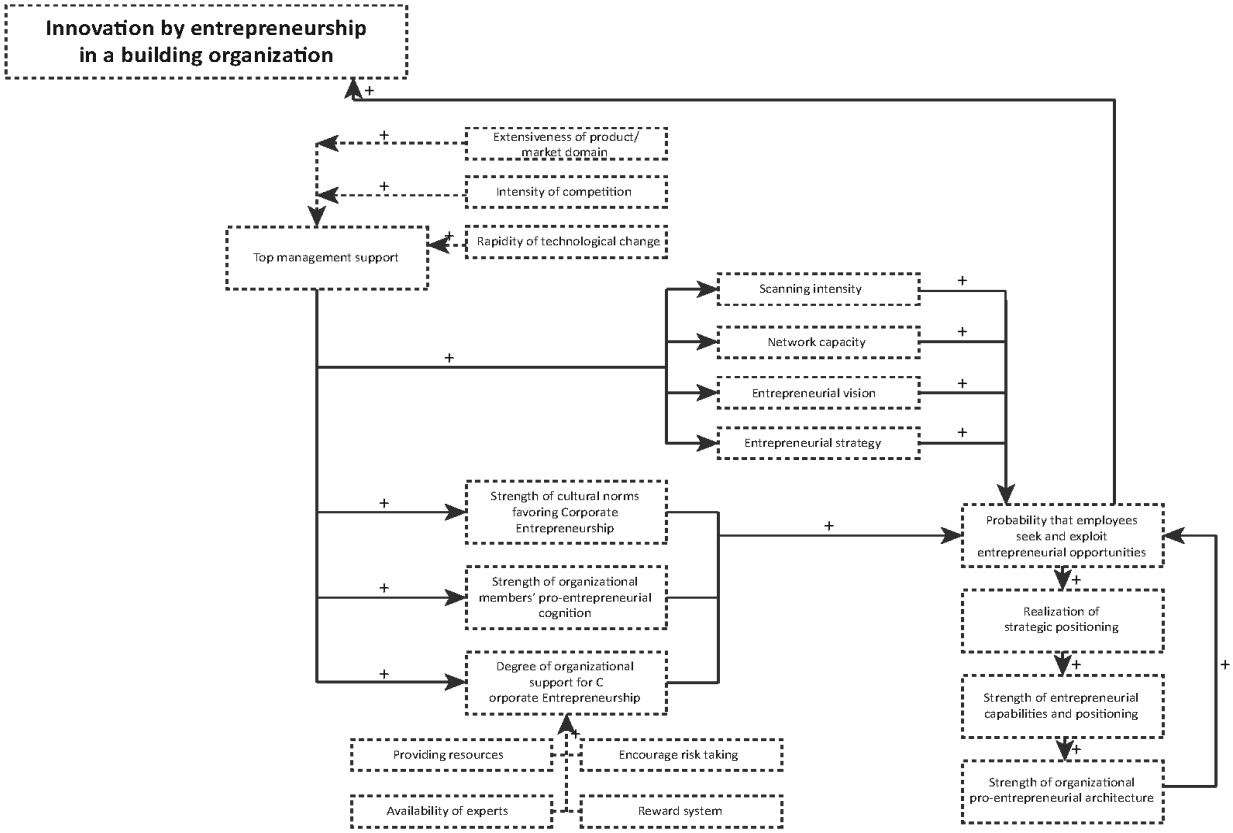


Figure 2: the theoretical subsystem of innovation incentives in the building industry

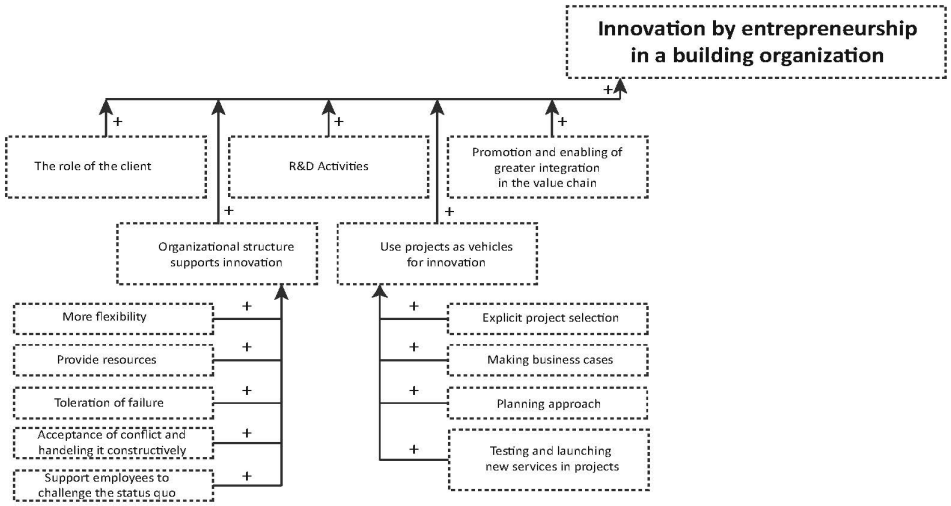
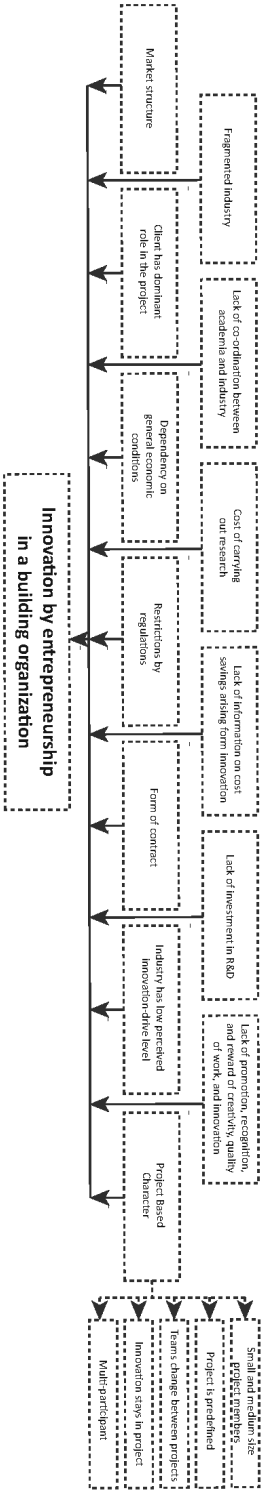


Figure 3: the theoretical subsystem of innovation barriers in the building industry



Appendix D Interviews protocol

Interview protocol

Interview – onderzoek naar de mogelijkheden van Corporate Entrepreneurship in de bouw.

Naam*:
Datum interview:
Functie:
Bedrijf*:

* Optioneel, interview kan ook geanonimiseerd worden weergegeven om bedrijfsgevoelige informatie te beschermen.

Inleiding

Voor mijn afstuderen die ik onderzoek naar de eventuele voordelen van het toepassen van Corporate Entrepreneurship in bouwbedrijven om innovatie kracht van bedrijven, en van de hele sector, te vergroten. Corporate Entrepreneurship is een concept wat al in veel andere sectoren wordt toegepast. Het is het idee dat een ondernemende houding binnen een bedrijf een positieve invloed kan hebben om de innovatieve ontwikkeling van het bedrijf. Bekende voorbeelden zijn facebook en google. In mijn onderzoek kijk ik naar wat Corporate Entrepreneurship succesvol maakt in deze sectoren, en hoe dat vertaald kan worden naar de bouw. Specifieke vraagstukken die bij de bouw naar boven komen worden meegenomen.

Ik zou graag met u praten over uw kijk op innovatie in de Nederlandse bouw, als mede in u bedrijf. Graag hoor ik uw mening over wat er verbeterd kan worden en hoe, en hoe u tegen het concept 'Corporate Entrepreneurship' aankijkt.

Algemene vragen

Innovatie in het bedrijf

1. Welke plek heeft innovatie in het bedrijf?
2. Wat doet het bedrijf om innovatie op te wekken?
3. Wat doet het bedrijf om innovatie te stimuleren en te behouden?
4. Hoe komt innovatie terug in de strategie en het beleid van het bedrijf?

Innovatie in de sector

1. Waarom word de bouw gezien als een traditionele sector die zich te weinig bezighoud met innovatie?
2. Wat kan het imago van de bouw veranderen?
3. Wat zorgt ervoor dat innovatie in de bouw zo moeizaam gaat?
4. Hoe kan innovatie in de bouw gestimuleerd worden?
5. Innovatie
6. Waarom is innovatie zo belangrijk?
7. Wat zijn de voor- en nadelen van innovatie?

Vragen over Corporate Entrepreneurship

1. Kent u het begrip 'Corporate Entrepreneurship'?
Zo nee: Corporate Entrepreneurship is een begrip uit de bedrijfskunde en gaat over ondernemend gedrag en acties binnen een bestaande organisatie. Het uit zich op het moment vooral in hightech bedrijven (voorbeeld: Philips, Google) die het gebruiken om innovatie te stimuleren en nieuwe ideeën te ontwikkelen. Voorbeeld: het starten van bedrijf in een bedrijf, actief alle werknemers stimuleren om een ondernemende houding aan te nemen, en nieuwe ideeën te ontwikkelen.
Zo ja: Wat vindt u van het idee, wat is volgens u de waarde van het concept, is het iets wat in uw bedrijf speelt/ zou kunnen spelen?
2. Welke rol kan een ondernemende houding spelen als het gaat om de ontwikkeling van innovaties binnen het bedrijf?
3. Welke mogelijkheden ziet u voor Corporate Entrepreneurship in de bouw?
4. Wat zijn de voor- en nadelen van CE binnen de bouw?
5. Hoe zou CE in de bouw kunnen werken?

Vervolg onderzoek
Het vervolg van mijn afstuderen gaat in om de organisatorische variabelen die het succes van CE in de bouw testen. Bent u bereid mee te doen aan 2 enquête rondes, die via de mail kunnen worden beantwoord, waarin u uw mening geeft over verschillende variabelen en of deze ja of nee van belang zijn bij het stimuleren van innovatie in een bouwbedrijf?

Weet u binnen uw bedrijf nog andere mensen die ook veel met innovatie en/of top management bezig zijn, en die ook aan deze enquêtes mee zouden willen doen? Het resultaat van mijn onderzoek kan ik aan alle deelnemers verstrekken, dit geven inzicht in de mogelijkheden die CE bied voor uw bedrijf.

Appendix E Interview record and qualitative data matrix

Interview I

Verkorte weergave / bedrijfskundige weergave
Het interview wordt geanonimiseerd om bedrijfsgevoelige informatie geheim te houden.

Introductie

Het literatuur onderzoek gaat vooral over de wetenschap, interviews zijn bedoeld om inzicht te krijgen in de Nederlandse bouw sector en grote bouwbedrijven. Het bedrijf bestaat uit meerdere bedrijfsstromen. In de bedrijfsstromen word geïnnoveerd, maar dit is beperkt. Een aparte bedrijfsstroom richt zicht op innovatie (CEO/CTO structuur). Deze is bedrijfsstroom overstijgend, en geeft meer ruimte voor innovatie. Binnen deze innovatie-stroom zijn er een aantal sub-stromen, die zich elk bezighouden met een innovatie-thema.

De innovatie die plaatsvindt in de traditionele bedrijfsstromen is beperkt. Er zijn stromen waarin innovaties heel gestructureerd worden uitgevoerd, maar de focus op innovatie is beperkt. Maar het uiteindelijke doel van het bedrijf is bouwen, niet innovatie. "Uiteindelijk zijn wij een bedrijf dat niet gefocusseerd is op innoveren, wij bouwen dingen voor mensen die dat aan ons vragen, en dat is belangrijk om te weten"

Er is nog lang niet genoeg innovatie binnen het bedrijf. Er worden wel een aantal producten ontwikkeld, maar het bedrijf is er niet op gemaakt om iets met deze producten te kunnen. Sommige innovaties vragen om een product fabrikant, terwijl de bouw enkel op projecten gericht is. Er zijn producten in de ontwikkeling, maar die kunnen nog niet goed gebruikt, ontwikkeld en toegepast worden. Producten in plaats van projecten levert een andere markt op. "Wij gaan van een project naar een product organisatie"

DBFMO contracten, daar leer je veel van. Er wordt dan meer gevraagd van de bouwer.

Er wordt veel gekeken naar nieuwe verdienmodellen. Er wordt gevraagd om, bijvoorbeeld, energievoorziening waardoor de taak en de verantwoordelijkheid van het bedrijf veel groter worden. Van bouwbedrijf naar bouwer, energieleverancier, etc. Zo kan je voordelen naar de klant bieden. Energie-aanbieder wordt dan deel van je aanbieding. Alle bouwers zijn aan het zoeken naar deze nieuwe rollen.

"Iedereen is zijn nieuwe rol aan het zoeken"
"Innovatie die we doen richtten zich op, naast project, ook op product en op exploitatie en facility management". Veel nieuwe innovatie richten zich niet op de kerntaken van de bouwer. Innovaties kunnen meer waarde aan je aanbieding geven, door ook te kijken naar de exploitatieperiode van het gebouw. De vraag naar een innovatie komt vaak vanuit een klant, de kunst is om de innovatie mee te nemen naar andere projecten de kunst en zo onderscheidend vermogen opleveren.

Sommige innovatie worden standaard geïmplementeerd in andere projecten. Dit kost moeite. Innovaties moeten uit een project worden gehaald, dit geschied door mensen die specifiek op innovatie gericht zijn.

De toekomst

Wat is de ideale situatie m.b.t. innovatie over 5 jaar? "Als het echt een droomscenario mag zijn [..]. Projecten brengen veel risico's met zich mee [..]. Maar wat gebeurd er als je innoveert op product, exploitatie en facility management, dan komt er een vaste (financiële) onderstroom. Dan ben je al bedrijf, over 5 jaar, door het verkopen van innovaties [..] sterker en stabieler."

Hoe bereik je dat er innovatieve ideeën worden ontwikkeld? Dat ligt erg aan het onderwerp.

"Er is op dit moment weinig geld om te investeren in innovatie." Kijken naar low-budget manieren om te innoveren. Veel samenwerken met kleine innovatieve bedrijven. Het grote bouwbedrijf is een goede partner, en het ideale verkooploket. Veel verschillende innovatieve ontwikkelingen tegelijkertijd ontwikkelen, niet meer 20 jaar op dezelfde ideeën. Het is van groot belang om op tijd te stoppen met een innovatie als hij niets gaat opleveren. Daar word tegenwoordig beter over nagedacht, over de kansen van een innovatie. Er wordt meer stroomlijning aangebracht in het innovatieproces (go/no go punten e.d.).

Innovatie in de bouw

Innovatie in de bouw is nu erg matig. Er is wel verandering gaande omdat bouwbedrijven met allerlei werelden/bedrijven in aanraking komt uit andere sectoren. De bouw is nog ouderwets in zijn ontwikkeling.

"Dat heeft allerlei redenen, meest doodmakende reden voor innovaties is de aanbestedingswet en normeringen en de wet- en regelgeving die hopelijk ouderwets is. Nog steeds word er in onze wet voorgeschreven hoe je moet bouwen [..]. De aanbestedingswet zorgt ervoor dat opdrachtgevers 50 aannemers aanschrijven, die niet mee morgen denken [..] ze mogen niet in gesprek met de opdrachtgever [..] op het moment van opdracht. Dat is super ouderwets. Door dat soort dingen zit het niet in onze cultuur om innovatief te denken."

Grote bedrijven zijn log en zwaar, de cultuur is zeer moeilijk te veranderen. Kleine bedrijven zijn sneller. Als je gaat innoveren, dan heeft het grote bedrijf meer middelen en die werken dan samen met kleinere bedrijven; dat is een mooie combinatie om te innoveren. Er zijn heel veel van deze kleine samenwerkingen. Er zijn veel innovatieve ideeën, maar het is moeilijk om in te schatten of het iets wordt. Daarom veel lijntjes tegelijkertijd openhouden.

Organisatiecultuur

Er is te weinig mogelijkheid voor medewerkers binnen het bedrijf om nieuwe ideeën te ontwikkelen. Dit komt omdat er geen tijd is om met ideeën aan de slag te gaan.

''Elk project is anders, echt leren van de dingen die we projectmatig fout doet, of de kansen die zich in het project voordoen gebruiken, komt niet genoeg voor."De waan van de dag richt zich op geld verdienen. De risico's van projecten zijn vaak groot, mogelijke financiële verliezen zijn groot. Een project moet af, vanwege beperkingen in tijd, geld en mensen. Het is al een hele inspanning om een project af te krijgen. Het is teveel gevraagd om mensen ook nog om innovatie te vragen. Daarom word innovatie losgetrokken uit de dagelijkse business. Geld voert de boventoon, en is belangrijker dan innovatie.

"Het maken van projecten gaat heel moeilijk samen met innoveren."Er is slechts een klein percentage (rond 5%) van mensen dat de innovatieve strategie van het bedrijf uitdragen. De rest is bezig met de dagelijkse gang van zaken. Het is ook belangrijk dat veel mensen zich met de dagelijkse gang van zaken bezig blijven houden. Et moeten niet enkel denkers in je bedrijf zitten, ook doeners.

Innovatieve ideeën komen uit het bedrijf, maar vooral van buiten het bedrijf. En dat moet ook wel, over je eigen muur heen kijken levert meer ideeën op. Qua innovaties moet je buiten je eigen bedrijf kijken, en buiten je eigen sector. Nieuwe ontwikkelingen in andere sectoren kunnen grote invloed hebben op de functionaliteit en eisen van een gebouw. Buiten het traditionele bouwen ben je bezig met nieuwe innovaties uit andere (verwante) sectoren. Bijvoorbeeld nieuwe producten in de mobiliteit, dat raakt aan het bouwen.

Het bedrijf is veel bezig met innovaties, zeker in vergelijking met andere aannemers in Nederland. Innovatief bezig zijn is leuk, het geeft het bedrijf

internationaal aanzien. Vooral concepten, het intellectueel eigendom, verkopen werkt goed als je kijkt naar product innovatie. Er wordt nu nog weinig aan licensing gedaan, maar daar zet het bedrijf wel sterk op in. Dat is een nieuwe tak van sport. Veel mensen die daarop worden gezet komen uit het bedrijf zelf. Maar het word steeds duidelijker dat je daar externe mensen met de juiste kennis voor moet aantrekken. Er moeten nieuwe mensen worden aangenomen met specifieke vaardigheden in innovatie. Bijvoorbeeld het verkopen van intellectueel eigendom.

Het traditionele bouwbedrijf over bestaat niet meer over 100 jaar. ''Het bouwen voor een zak geld gaat eraf"De vraag wordt anders; de vraag is niet bouw dit kantoor, de vraag is bouw de ideale werkomgeving. De wet- en regelgeving is er nog lang niet om dit mogelijk te maken. In andere landen mag de bouwer zelf meer bepalen. De Nederlandse omgeving, het bouwbesluit, maakt het moeilijk om innovaties toe te passen.

"Het bouwbesluit is zo ouderwets, dat is eigenlijk om te lachen"
''Als je alles vastlegt is er geen ruimte voor innovatie"Innovatie is traditioneel gezien geen deel van de bouw. Waarom doet dit bedrijf dan wel aan innovatie? Terwijl regelgeving tegenwerkt en de klantvraag ernaar beperkt is. De reden dat het bedrijf het toch doet; de CEO vindt dat je mensen nodig hebt die een andere kijk op de wereld hebben. De stimulatie tot innovatie komt dus vanuit het top management, die geeft vrijheid aan de medewerkers. Je moet verbeteren en vernieuwen tegelijkertijd. ''Door de vrijheid van het topmanagement en het hebben van een goede visie krijg je ook een innovatieve cultuur"

Het is moeilijk om een innovatieve cultuur te kweken. Er zijn mensen binnen het bedrijf die niet op de hoogte zijn van de innovatieve ideeën van het bedrijf. Voor de bedrijfstrots en de uitstraling van het bedrijf zou het wenselijk zijn als alle medewerkers de innovatieve cultuur zouden uitdragen. Het is goed als mensen die niet dagelijks met innovatie bezig zijn, toch de visie uitdragen.

Mensen binnen een bedrijf zijn niet geneigd hun werkpatronen aan te passen. Als mensen al 25 jaar op dezelfde plaats zitten, houden ze zich aan het werkpatroon dat ze 25 jaar geleden hebben aangeleerd. Dit maakt het doorvoeren en gebruiken van nieuwe technieken veel moeilijkheden tegenkomen. Dat zegt iets over de cultuur in de bouw. Het veranderen van cultuur is moeilijk.

"Ik doe dit al 25 jaar zo, en ik ga het niet anders doen ook" – MedewerkerHet is moeilijk om constant kritisch te blijven kijken naar de eigen werkmethode. Er wordt hier ook meestal geen gelegenheid tot gegeven, dit mag je je aantrekken als management. Die moeten de ruimte, kans en drang geven aan medewerkers om te veranderen. Zij moeten het voorbeeld zijn, en dat zijn ze vaak niet omdat deze ook sterk op traditionele werkwijze gericht zijn. Het midden management werkt ook meestal al lang binnen het bedrijf, en denk dus in traditionele manieren.

Mensen uit andere sectoren aantrekken is gunstig, omdat deze een nieuwe blik hebben op processen en producten. Dat werkt goed. Mensen moeten niet vastgeroest zitten in bepaalde gedachte patronen. Dit lijkt een open deur, maar blijft toch lastig. Hoe kan je de bedrijfscultuur nou zo veranderen dat mensen kunnen en willen meegaan met veranderingen en innovatieve ideeën? De leiding moet de innovaties en nieuwe werkwijze uitstralen en erachter staan.

"Als de leiding al ouderwets is [..] gaat het nooit lukken"
Een ander cultuur probleem is het beloningssysteem. Mensen worden niet beloond op hun innovatieve gedrag. Het is lastig om een systeem te ontwikkelen waarin een innovatieve houding word gestimuleerd en gewaardeerd. Er wordt veel gewerkt aan innovatie, maar dit harde werken wordt niet beloond in het huidige systeem.

Afsluiting
Uitleg vervolg onderzoek en verzoek tot deelname aan dit onderzoek.
De geïnterviewde wil graag meedoen, en weet ook nog enkele andere mensen die mee kunnen doen.

Interview II
Verkorte weergave / bedrijfskundige weergave

Introductie
Er mag meer flexibiliteit komen in de werktijden van een bedrijf.

Korte uitleg waar dit onderzoek over gaat, en hoe het ontstaan is. Korte theoretische uitleg over Corporate Entrepreneurship. Wat kan je met je cultuur en structuur doen om mensen meer ruimte te geven om innovatief te denken.

Het literatuur onderzoek is de basis van dit interview. En deze interviews zijn bedoeld om een algemeen beeld te krijgen van bedrijven in de bouw in Nederland. Na de interviews komt er een vervolg onderzoek om de Nederlandse markt te onderzoeken. Bjorn Smeets (hierna ook: B.S.) is geïnteresseerd in het eindresultaat.

Dura Vermeer
Uitleg over de structuur van Dura Vermeer en de rol van Bjorn Smeets hierin. Het bedrijf heeft diverse divisies. B.S. is landelijk manager inkoop, waarbij hij het team van inkopers van de divisie infrastructuur aanstuurt. Alle inkopers zijn centraal geregeld, maar decentraal geplaatst. Hij ontwikkeld een lead-buyership positie hebben. Er zijn daarna nog een aantal divisies, voor o.a. materieel, auto's, bouw en vastgoed divisie, onderhoud.

Landelijke inkopers(twee), lid van raad van bestuur en twee divisiedirecteuren organiseren samen de overkoepelende inkoop.

Er is een visie binnen de divisie op innovatie. Innovatie op zowel proces en product worden uit de markt aangetrokken. ''De visie is daarbij dat we een magneet zijn voor startups, voor MKB'er om bij ons, samen met ons, innovatie te vervolmaken."Ze zijn met veel innovaties tegelijkertijd bezig, tientallen.
Niet extreem gestructureerd, niet van bovenaf geïnitieerd. ''We proberen zo veel mogelijk op de werkvloer ruimte te geven voor innovaties en we hebben natuurlijk ook een aantal centraal gestuurde innovaties."

Er kan centraal funding vrijgemaakt worden, want innovatie moet uiteindelijk wel betaald worden. Innovatie en ondernemerschap zijn pijlers in de visie van Dura Vermeer. Binnen inkoop merkt je dat in elk raamcontract staat innovatie genoemd. Als je een contract afsluit, moet je innovatie meenemen. Er zijn vijf thema's die in elk raamcontract terug moeten komen; (1) energiebesparing (CO2, gebruiken van groene energie, of gebruik geen energie), (2) afval (niet creëren, als het er toch is, zorg dan voor goed scheiding). In totaal wordt 95% van het afval gescheiden, het hoogte percentage binnen de bouw. Dit heeft veel effort gekost), (3) grondstofgebruik (minimalisatie, kijk naar circulaire grondstoffen). (4) Innovatie (altijd over hebben met contractpartij). Stel de vraag; welke innovaties hebben jullie de afgelopen drie jaar gedaan, en met welke innovatie komen we volgend jaar samen; hele uitdagende vraag). (5) Social Return (mensen met een afstand tot de arbeidsmarkt een kans geven). Dit vraagt meer toewijding (opleiding e.d.) van de werkgever. Het is ook commercieel positief, maar vraagt meer tijd).

''Omdat deze 5 punten altijd terugkomen, en aan leveranciers te vragen, selecteer je ook meer op waard en minder op prijs. En wordt het een veel interessanter gesprek. ''''Zonder Profit is er geen People en Planet"

Als er geen profit is, is het geen bruikbare innovatie. Vraag aan degene die met de innovatie komt wat hij

er denkt mee te kunnen verdienen. Wat doet het voor je marge, maakt het een bedrijf gezonder? Probeer samen met leveranciers te innoveren. Voorbeeld van innovatie: lichtbak voor bij werkzaamheden op de snelweg. Het mes snijdt dan aan meerdere kanten. Je moet aantoonbaar kunnen maken wat een innovatie creëert en oplevert. Je moet wat het oplevert in simpele taal kunnen uitleggen.

Innovaties komen bij de inkoop kolom veel via de leverancier. Maar ook binnen het eigen proces zijn ze opzoek naar innovaties. Waar kun je dingen verbeteren? Maar ook vanuit de strategie. ''Daar moet je gewoon dingen anders voor gaan doen dan dat je de afgelopen jaren hebt gedaan. Hoe ga je dat nou organiseren? Door het elke keer in de lijn terug te leggen, in beoordelingsgesprekken wordt ernaar gevraagd. ''

Er worden pluimen uitgereikt, via het intranet, omdat iemand iets slims heeft bedacht. Dat geeft mensen een stimulans om te innoveren. De erkening. Innovatie en onderneming staat bij het bestuur op de agenda. Wat levert een idee op het gebied van duurzaamheid, veiligheid e.d. Het helpt als het bestuur dat uitdraagt, ook naar de buitenwereld toe.

Iedereen heeft innovatie in zijn visie staan, alle bouwbedrijven. Terwijl het in de praktijk toch vaak beter kan. Het top management moet het uitdragen, dan krijgen andere mensen ook het gevoel dat het belangrijk is. Het is vaak zo dat medewerkers met nieuwe ideeën komen, en daar krijgen ze ook de ruimte voor. ''De vakman op de werkvloer die dan ergens tegenaan loopt, en dan door de directie in het zonnetje wordt gezet [voor zijn nieuwe idee]"

Als je met een goed idee komt, dan krijg je de ruimte. Dit zijn vaak kleine ideeën, maar daar kan je ook groot mee worden. Doordat Dura Vermeer een familiebedrijf is, is er vaak sprake van een langdurige relatie tussen werknemers en het bedrijf. Dit geeft mensen ook een boast om te innoveren. Er is ook een laboratorium, die zich richt op de 'harde innovatie'. Dat is niet het ondernemerschap. Dat kan elk bedrijf.

''Wat op het moment heel lastig is, omdat we in een markt zitten waar puur op prijs geconcurreerd wordt [..] je kan je niet onderscheiden met innovatie. Het is gewoon op prijs een concurrentieslag, er is een keiharde prijsdruk"Er zijn wel projecten waar innovatie en kwaliteit belangrijk zijn. Maar vaak blijft prijs voor een groot percentage meetellen in de selectie. Als de opdrachtgever niet vraagt om innovatie, dan is er geen ruimte voor om het toe te passen.

''Als je alleen prijs meeneemt in de selectie, dan kill je eigenlijk de innovatie"Bij integrale contacten zijn innovaties vaak makkelijker toe te passen, omdat onderhoudskosten ook worden meegenomen. Opdrachtgevers die wel hun nek uitsteken en om innovatie vragen zijn er el, maar het is nog incidenteel, niet structureel. De overheid heeft voornamelijk externe ingehuurde mensen. Die willen zo veel mogelijk uren draaien, om zo veel mogelijk te factureren. Dit werkt een korte termijn visie in de hand. Er is een prikkel om dus voor prijs en veel werk te gaan, niet voor lange termijn.

''Er zijn de verkeerde prikkels in het proces, die zitten in het bedrijfsleven, bij de overheid, door de hele keten heen.''Als je eigenaar blijft van het product wat je verkoop, dan is er meer prikkel om te innoveren. Er komt dan een ander model. Wat eerst afval was, is dan een grondstof voor een nieuwe product. In andere bedrijfstakken gebeurt dit al (mobiele telefoons).

Sommige innovaties zetten de markt volledig op zijn kop. Funda voor de makelaars, prijsvergelijkers voor energieleveranciers. Dit zijn voorbeelden die de bouw zou kunnen adopteren. Jumbo en AH werken op een aantal punten volledig samen. En op andere dingen vechten ze elkaar de tent uit. Er is een samenwerking tussen alle partijen, en aan de andere

kant is het keiharde concurrentie. In de bouw branch, zou Bouwend Nederland deze rol kunnen pakken. Ze moeten dat veel harder communiceren.

Innovatie in de bouw lijkt nu een landschap van eilandjes. Bedrijven concurreren elkaar op innovaties. En sommige dingen zijn ook wel echt concurrentieel, maar er zijn er ook veel die dat niet zijn. Een aantal dingen worden wel afgestemd, en is er standaardisatie (voordeel: asfalt). Maar hier is veel te weinig in gebeurd. Er wordt ook veel samengewerkt met andere branches, daar moet ook mee afgestemd worden; 1 op de 3 vrachtwagens op de weg rijdt voor de bouw. Als branche zou je hier veel meer kunnen doen, door samen eisen te stellen. Bijvoorbeeld tegen overlading. Er wordt niet gepraat met verschillende afdelingen.

''Als je innovatie wilt stimuleren moet je ook voorwaarde stellen. ''Je wilt niet al je eigen ideeën weggeven. Maar in andere branches worden innovaties wel gedeeld, of snel overgenomen.

''Alles komt neer op: wat wilt de klant. De betaler bepaald."Als er in de aanbesteding fasen geen alternatieve inschrijving kan, omdat het dan moeilijk wordt om aanbieders te vergelijken, dan word innovatie gedrukt. Als de klant er niet om vraagt, dan gebeurt het niet. Een duidelijke klantvraag, helpt bij innovatie. Als de overheid gaat zeggen; we willen [ander criteria] dan kan er snel op ingesprongen worden. Maar nu kan je als bedrijf je er niet mee onderscheiden. Een stip aan de horizon is belangrijk om naartoe te kunnen streven. Innovatie wordt nu nog niet beloond in de aanbesteding.

Er zijn wel nieuwe ontwikkelingen die om innovatie vragen. BREAM is zo'n voorbeeld. De klantvraag is er dan, omdat de huur hoger kan, en dan worden innovaties gebruikt. Woningen worden steeds meer energieneutraal, omdat de klant daarom vraagt.

De overheid vraagt niet om innovatie en willen er niet voor betalen. Soms wordt er om innovatie gevraagd, maar dit is beperkt. Er is nergens een stip op de horizon. Ze houden zich streng aan de wetgeving die er op dit moment is.

De overheid zou ook het gesprek met de bouw aan kunnen gaan, en de ruimte geven om innovaties toe te passen. Bijvoorbeeld door het hele proces financieel te berekenen (garantie, onderhoud e.d. meenemen in de aanbestedingssom: Total Cost of Ownership (TCO)).

Het is belangrijk om te kijken naar de terugverdientijd van innovaties. ''We zijn blij met 0% winstmarge in het jaar, zwarte cijfers zijn het doel"Alle grote bouwbedrijven maken verlies. Dit komt door zowel de opdrachtgever als de bouwer. Er is zo geen ruimte voor innovatie. Samen voor een idee gaan, er samen aan beginnen.

''Je moet nieuwe mensen aan trekken die het leuk vinden om nieuwe kansen te krijgen.''Jongeren binnen het bedrijf krijgen de tijd en ruimte om met nieuwe ideeën te komen, ze worden ervoor getraind.
Het support van het top management, en de bereikbaarheid ervan, maakt nieuwe ideeën ontwikkelen makkelijker. Dat is wel een sleutel van succes.

''Innovatie, duurzaamheid, als je dat niet in de lijn borgt [..] dat kan niet, het hoort bij de bedrijfsvoering van deze tijd"Puur vanuit facturen beoordelen, is niet van deze tijd. Door mensen te beoordelen op meer dan hun financiële prestaties, stimuleer je medewerkers om te veranderen en nieuwe ideeën te ontwikkelen. Voorbeeld: standaard begrenzing van vrachtwagen is 89 km/h. Veranderd naar 85 km/h. Dit merkt niemand, maar bespaard 10% brandstof.

Ander voorbeeld: de energy-battle. Waarbij medewerkers worden beoordeeld op het gebruik van hun auto (boetes, schades, verbruik e.d.). Medewerkers

worden geranked, en krijgen daar feedback op. Zo kun je zien hoe je scoort t.o.v. andere medewerkers met dezelfde auto. Ook de baas kijkt mee, en dus wil je zo goed mogelijk scoren. Hierdoor dalen de kosten per auto. Deze innovatie verdient zichzelf terug, maar het vraagt wel om veel tijd en aandacht.

''De bouw innoveert heel veel, maar schreeuwt het niet van de daken. En wat we innoveren is geen rocket-science"Er komt steeds meer marketing rond innovatie in de bouw. Voorbeeld: Heijmans en het Canal-house. Dat is goed bedacht.

Verbeteringen. Wat mag nog beter?
''Ik denk dat we nog wel wat hele grote, dingen baanbrekend anders moeten doen. Om meer waarde te krijgen in onze projecten. Het beste plan wint een aanbesteding. Wij moeten nog wel wat baanbrekende dingen gaan doen. Dit betekend dat we nog lef moeten tonen, veel lef"

Dit neemt wel meer risico met zich mee. En je wilt niet dat zo'n project je de kop kost. Dus men is heel terughoudend, omdat het risico hoger is. Daar zou je iets voor moeten verzinnen. Een risico-innovatie fonds. Waar je echt mooie, nieuwe dingen in ontwikkeld. De innovatie is dan voor iedereen. Dan creëer je de funding voor durf, voor echt andere dingen. En dat gaat komen, jongen mensen gaan dat veroorzaken. Maar daar wil ik niet meer 5 jaar op wachten, dat mag snel gebeuren. Het Nederlandse bouw-innovatie fonds; voor echt nieuwe dingen. Als overheid en branche moet je dat soort dingen stimuleren. Er zijn al wel wat fondsen hierdoor, maar dit is nog te ingewikkeld.

De branche moet meer gaan doen, en innovaties meer bekendheid geven. Bijvoorbeeld het bij houden van welke aanbestedingen ruimte laten voor innovaties. Hierdoor kan je opdrachtgevers ook meekrijgen, door te laten zien dat zij ook meer kunnen doen. Bouwend Nederland zou goed rumoer kunnen maken in Den Haag, om daar tot actie aan te manen. Het mag allemaal wat luider en harder. Het is nu allemaal heel correct, maar er mag wat meer geluid worden gemaakt. Je hoeft de innovatie zelf niet centraal te creëren, maar je kan wel samen de ruimte en vraag creëren.

Vraag om mee te doen met het vervolg onderzoek. Deze enquêtes kan ik opsturen, dan worden ze doorgestuurd. Het interview hoeft niet geanonimiseerd te worden, citaten moeten voor plaatsing worden overlegd. Zet bij de enquête: Wie ik ben, en wie ik aangeschreven wil hebben.

Interview III
Verkorte weergave
Interview met Coen Faber, Pure Birds

Introductie
Uitleg over het onderzoek. Achtergrond informatie over Corporate Entrepreneurship en de literatuur review. Het creëren van een ondernemende houding en het ruimte maken voor innovatie binnen de bedrijfscultuur.

Corporate Entrepreneurship wordt nog weinig toegepast in de bouw, maar er is maar weinig onderzoek naar gedaan. Doel: het maken van een model wat laat zien he C.E. kan werken in de bouw. Het valideren en wegen van variabelen d.m.v. literatuur onderzoek en enquêtes. Corporate Entrepreneurship wordt in dit onderzoek gezien als een bedrijfscultuur die ondernemen stimuleert en ruimte geeft. Dit is in veel andere sectoren al succesvol, en kan dit ook naar bouwbedrijven worden vertaald.

Het doel van de interviews is de praktijk verbinden aan de literatuur. Coen Faber: niet verbonden aan en bouwbedrijf, maar werkt in diverse ketens waaronder de bouw > ketenvernieuwing. Verspilling en verdienmodellen te verbeteren. In de economie is ingegroeid dat iedereen zijn rol in de keten optimaliseert, en denk heel efficiënt te kunnen werken

op die manier. ''Er zit hier echter een eindigheid in; qua hoeverre je je goedkoper kunt maken. En als je wil innoveren moet je dat toch met de ketenpartijen doen. ''

Je denkt dat je de kosten beheerst als je naar je eigen rol in de keten krijgt. Maar je moet het contact met de klant niet verliezen. Je moet vernieuwing gaan brengen in je terrein, maar dat lukt niet als je louter op jezelf gericht bent, op je eigen rol in de keten.

Aannemers en opdrachtgevers krijgen steeds meer in de gaten dat je de keten nodig hebt om een goed bouwproject te maken. Deze bewustwording komt er steeds meer, maar wat dit in de praktijk betekend moet nog worden uitgebreid. Coen Faber is ook universitaire docent geweest.

Business model canvas
Heel handige tool. Moet wel goed gebruikt worden. Het is theoretisch niets nieuws, maar een heel makkelijke manier om strategie neer te zetten. Het canvas werkt van rechts naar links, van de klant naar het bedrijf. Bedrijven hebben weinig tijd voor strategie. En het bestaat vaak uit veel rapporten die in lades verdwijnen.

De bouw
Coen Faber heeft geholpen aan de bouw innovatie agenda (GW bouw). Waarom slaagt innovatie? Dat hangt aan veel factoren en veel hiervan zijn cultureel, en dat werd nooit onderkent. De Agenda ontwikkeling begon in 2004, waarbij de cultuur vanuit de overheid werd uitgedragen.

''Innovatie is vaak geen technische uitdaging, maar een maatschappelijke uitdaging. Het probleem is: hoe krijg je het toegepast, hoe ga je dat doen?''''Hoofd prioriteit is gamma-kennis: hoe gaan we innovaties ontwikkelen?" Het is vaak het ingenieurs denken; innovatie wordt geassocieerd met techniek en dat heeft vaak als probleem dat er niet goed over het verdienmodel wordt nagedacht, het verdien model in de bouw. Als er een innovatie is, dan moet dat maar ingevoerd worden.

''Er wordt vaak naar de opdrachtgever gewezen, dan ligt de schuld (van het niet kunnen toepassen van innovatie) bij de opdrachtgever. Maar die heeft maar een beperkt budget [..] je moet met elkaar kijken naar het verdienmodel."De overheid wil een bepaalde garantie dat iets werkt, end die is er bij innovatie vaak niet.

''Je moet met elkaar innovaties maken. ''Het samenwerken gaat heel moeizaam, vooral als het erg technisch gedreven is. De opdrachtgever heeft zelf steeds minder technische kennis. Nu mag de markt het verzinnen, maar de discussie blijft technisch, en de opdrachtgever kan daar niet meer in mee.

Er wordt heel project gebonden gedacht. In een groot project worden innovaties vaak nog wel toegepast (waarvan de helft vaak niet lukt). Maar daarna gaat het niet meer verder, de innovatie blijft in het project. Er is geen ondernemende cultuur bij bouwbedrijven. Er wordt niet meteen gekeken naar waar innovaties ook toegepast zou kunnen worden, waar de innovatie ook zou passen. ''Er wordt slecht nagedacht over hoe innovaties meegenomen kunnen worden naar een volgend project"

Er zijn wel initiatieven, om kennis te delen. Mar de markt gaat daar moeilijk mee om. En dan is het makkelijk om naar de opdrachtgever te kijken, maar je kunt ook als aannemer zelf ondernemend zijn.

In projecten ontstaan tijdelijke organisaties, met een eigen cultuur. Waar niet veel gedeeld word en die snel weer uit elkaar vallen. Andere sectoren kijken beter naar kennisdiffusie. Er wordt heel weinig gedeeld en naar andere projecten gebracht. Om innovaties succesvol te krijgen heb je opschaling nodig. Er wordt te veel project gebonden gedacht en niet naar een grotere

marktscope gekeken. Het is een gegeven dat de bouw in Nederland veel regionaal of lokaal georiënteerd is. Maar en wordt nog steeds veel gebouwd, dus je kan nog steeds nieuwe verdienmodellen ontwikkelen die innovaties rendabel maken.

''Het verdienmodel in de bouw is heel veel projecten doen, terwijl je meer moet gaan denken in een productieproces; in diensten leveren." Eerst moesten er veel nieuwe projecten gebeuren, maar nu verschuift de focus, er wordt veel meer onderhouden en binnenstedelijk gerenoveerd. ''Minder denken in grote projectportefeuille, je moet naar een ander model dat je continue diensten levert, of producten, en daar over nadenken hoe je dat steeds slimmer, innovatiever en duurzamer kan doen."

Er worden mooie projecten gebouwd. En er zijn ook partijen die nadenken over hun rol in de keten. Er zijn ook toeleveranciers die zich ermee gaan bemoeien. Er zijn bepaalde drivers nodig om te innoveren. Een belangrijke driver is klantvraag. Dat is een cultuur issue in de bouw. ''Bouwbedrijven focussen op de opdrachtgever, maar de opdrachtgever is niet de klant. ''Er zijn wel bouwbedrijven die hiermee bezig zijn (zoals TBI). Het eindproduct wordt steeds complexer, en de rol van het bouwbedrijf veranderd dus ook. En dan ga je niet meer in een project denken, maar dan ga je met elkaar een verdienmodel maken waar een marge in zit.

Het meest complexe en dure in een project wordt de hoofdaannemer. Dit verschuift in complexe projecten vaak naar andere branches. ''Een organisatie cultuur veranderen kost 5 tot 10 jaar"

De verantwoordelijkheid komt steeds meer bij de bouwer te liggen (bij het gebruik van integrale contracten). Dan wordt er slimmer nagedacht over de lange termijn en exploitatiefase. Dan kan er nagedacht worden over innovatie. Maar als de cultuur niet op innovatie gefocust wordt, dan worden er geen innovaties toegepast. Er wordt dan nog meer voor zekerheid gekozen, als er een langere periode van verantwoordelijkheid is, en niet voor innovaties.

Condities voor cultuur zijn heel belangrijk, die ondersteunend zijn. Als er erge boetes zijn als een innovatie niet goed uitpakt, wordt de innovatie vaak niet toegepast. De bouw maakt wel gebruik van pilot projecten en proefruimtes. Alleen blijft de innovatie dan vaak hangen in de pilot. Dit is een hele langzame vorm van het testen van innovaties.

Samenwerking omtrent innovatie.
''Open innovatie klinkt mooi, maar dat lukt niet als er een hoge 'ieder voor zich' mentaliteit is. Iedereen wilt zijn kans pakken. ''Er moet een gezamenlijke commitment zijn; samen aan innovatie werken. Het gezamenlijk belang van innovatie moet onderkent worden; je kunt er uiteindelijk allemaal, ieder voor zich, beter van worden. Voorbeeld: innovatie in de water sector. Daar is veel samengewerkt om er uiteindelijk individueel meer uit te halen.

''De bouw heeft een hele belangrijke rol, kan zich als innovatieve sector gelden, maar laat zich gedragen als traditioneel en conservatief. ''De mate van verstedelijking geeft veel kansen voor de bouw. Maar er wordt weinig samen nagedacht over dit probleem. Je zou hier ieder voor zich op de lange termijn ook voordeel uit kunnen halen, net als in de water sector. Iedereen vecht om kleine projecten, niet gericht op het oplossen van grote problemen.

''Je kunt samen nadenken over een grotere koek, maar nu vecht iedereen over de kruimels. ''Innovatieve mensen worden vaak geprikkeld door grote vraagstukken. Andere branches springen vaak al in op problematiek gerelateerd aan de bouw. Siemens, kassenbouwers, Philips e.d. richten zich op actuele problemen, en kunnen de bouw op een zijspoor zetten. Bouwers worden dan enkel aannemers voor deze innovatievere bedrijven.

Er zitten wel veel jonge mensen in de bouw die heel veel ondernemerschap kennen. Het gezamenlijk belang moet vernieuwd worden, een gezamenlijk agenda voor innovatie. Veel is overheid gedreven. Vanuit de markt zijn er wel steeds meer projecten die innovatie gebruiken.

Het beloningsysteem is belangrijk bij het aanwakkeren van innovatie, net als het geven van ruimte en financiële hulp.

De architect/ontwerp fase is vaak veel innovatiever, maar in de uitvoering is er een hele andere cultuur waardoor zo 80% van de nieuwe ideeën van tafel gaat. Er zit een verschil in cultuur in ontwerp en uitvoeringsbedrijven.

De branche

Bouwbedrijven moeten meer samenwerken. Bouwend Nederland kan hier een rol in spelen door een proactieve houding aan te nemen, en niet de traditionele houding van bouwbedrijven te ondersteunen. Bouwend Nederland probeert ook leden te werven in andere branches.

''Een innovatie agenda is een conditie voor het creëren van een innovatie klimaat. ''Het lukt tot nu toe niet om één innovatie agenda op te stellen. De wetenschap roept van buiten, veel verschillende meningen. Dat is een startpunt waar iedereen het min of meer mee eens moet zijn, en dan kan iedereen dat binnen het eigen bedrijven ontwikkelen en gebruiken. Denk in systematische en continue activiteiten, minder in projecten. Innovatie moet systematisch in het proces worden toegepast. Als je per project kijkt hebben kleine bedrijven geen kans.

''Je ziet steeds meer personen op topposities, en jongere managers, dat zijn mensen die niet de oude cultuur uitdragen, maar naar een nieuwe cultuur zoeken."Vaak moet er een ramp gebeuren voordat er echt iets gebeurd. Voorbeeld; dan moeten files maar zo groot worden dat mensen de trein in gaan. Dat is in de bouw ook. Het bewustzijn moet er komen dat er geen grootschalige nieuwbouw is. Je moet slimmer over het proces gaan nadenken.

Ga je samen een vernieuwing bouwen? Het is de uitdaging of dat dat besef er al voldoende is. Er zijn partijen die dat wel zien, maar veel partijen gunnen elkaar nog weinig. Laten zien en communiceren is een lastig verhaal. Er is nog een lange weg te gaan om vertrouwen te krijgen in samenwerking.

Het vertrouwen in elkaar is zo slecht omdat de cultuur gericht is geweest op steeds lagere kosten. Dit is bij de bouw heel ver doorgevoerd. We denken; als je heel slim inkoopt, dan ben je beter af. Maar je helpt dan wel relaties om zeep.

De consument heeft weinig kennis over de bouw. Hier ligt een taak voor bouwbedrijven. Om meer te organiseren en zo de keten mondiger te maken. Een voorbeeld hierin is duurzame energie, waar veel lokale initiatieven in zijn. Dat zijn positieve impulsen. Een grotere bewustwording bij de eindgebruiker. Dit gaat hand in hand met binnenstedelijke ontwikkelingen, wat tegenwoordig veel normaler is. De klant zit er meer bovenop en ziet meer. Er is een groot verschil tussen mensen die wel meedenken met de opdracht, en mensen die iets gewoon laten bouwen. Klantgericht denken is een positieve stimulans voor innovatie; het sociale aspect. De vraag om comfort en gemak komt vanuit de klant, en dat is een positieve prikkel voor bouwbedrijven om te innoveren.

Veel bouwbedrijven zien de architect of de opdrachtgever als klant. De eindgebruiker wordt niet als potentiele bron van informatie en innovatie gezien. Er is maar weinig oog voor de omgeving en lokale stakeholders. Er wordt met getallen gewerkt en niet met mensen.

De ‘Golden Circle; veel bouwbedrijven richten zich op de ‘wat’ en niet of het ‘waarom’. Terwijl het waarom veel impact heeft op werknemers en klanten. Voorbeeld: Apple. Die werken vanuit een concept, het doorbreken van de status quo. Hoe; door een mooi apparaat dat het altijd doet. Wat: een gadget. Een beginpunt is anders. En dus staat een Apple product voor meer. In de bouw is dit eigenlijk niet. De bouw verkoopt zich niet als een ‘waarom’ maar als een ‘wat’. Bedrijven die een ‘waarom’ verkoopt trekken meer mensen aan, meer potentiele werknemers.

Afsluiting

Je kan deze interviews ook gebruiken d.m.v. kwalitatieve data matrix (qualitative data matrix – Katinka Belsma). Dan kun je kwalitatief maken hoe respondenten antwoorden in interviews. Hiermee kun je antwoorden structureren van verschillende interviews.

Uitleg over het vervolgonderzoek, en vraag om deelname.

Qualitative data matrix
A representation of the interview respondents.

Aspect	Respondent A	Respondent B	Respondent C
Innovation in the organization			
The current place of innovation in the organization	There is a separate organizational division that focusses on innovation. The other, more traditional divisions have limited focus on innovation (varies from none to sufficient). ''In the end, we are a company that does not focus on innovation, but on building what people ask us to build'' Very few people propagate the innovative strategy of the organization	Every employee is stimulated to be innovative Every contract asks for innovation Innovations need to be profitable. Loyalty of employees enhances their innovative thinking. Innovation should be incorporated in every modern business.	Not a member of a building organization, but a consultant.
The current vision of the organization on innovation	Searching for cooperation, and developing many innovative ideas simultaneously. Innovative ideas are mainly born outside the organization. Creating intellectual property Innovation can get you noticed A new look on the world is necessary.	Attracting innovative ideas from outside the organization Innovation on both process and product Give employees space to be innovative in their daily work	Organizations often have limited attention towards the creation of a good strategy.
Current stimulation and development of innovation	Finding low-budget ways to be innovative Cooperation with small companies Develop a lot of new ideas simultaneously Top Management support	Cooperation with smaller companies Developing a lot of new ideas simultaneously Available funding for new ideas Innovation is a part of the organizational structure	
How should the organization increase its innovativeness?	Focus on not solely project, but also on product and exploitation and facility management. Learning from projects Get all organizational members on board; make them aware of innovative ideas and make them ambassadors of innovation.	Attract new people Create more disruptive innovations; innovation that are really different. Taking risks	It's culture
Innovation in the building industry			
The image of the industry	Very traditional Innovation is, traditionally, no part of the building industry. There is change coming, due to globalization and increase in collaboration.	There is innovation in the building industry, but these are small innovations.	Traditional and conservative industry.
Changes in the industry	From project to product organizations Building organizations get new roles and responsibilities The client asks for more innovation Other industries influence the building process The commission changes. No longer 'build such an office' but 'build a work environment'	The client asks for more innovation Certificates as BREEAM.	Client gets more involved Suppliers add innovative ideas. The building organization gets more responsibilities in the exploitation. Increase in urbanization; offers new opportunities.
Barriers to innovation	Working in projects The cost of innovation The tendering procedure Laws and regulations (aanbestedingswet en bouwbesluit) Large companies are cumbersome Culture is very difficult to change There is a strong focus on money Risks are large Projects have limited time, money and people Strong focus on day-to-day business People are not likely to change their work methods	Focus on price Government employees have short term perspective. The entire chain is focused on the wrong incentives (price). The tendering process; no reward for innovation. The client doesn't ask for it. The government doesn't require innovation, and even limit the possibility to innovate.	The strong focus on price; everything always needs to be cheaper. Not enough thinking about the earnings of an innovation. Limited cooperation Innovation is often perceived as a solely technical problem. Project based industry No innovative culture in building organizations. The organizations blame the government and lack own

	The general culture in the building industry The current reward system		initiative. The current reward system Market structure Fragmented nature Fierce competition Lack of trust Focus on client, not end-user.
How to create more innovation in the industry	New revenue models Cooperation with other industry, getting people from other industries involved in the building process.	Less focus on price, more on quality and Total Cost of Ownership Ownership of the product stays with the one who created it (garbage becomes material) More cooperation between building companies. The client should demand innovation More branch-wide action	Work together with partners in the building chain. Innovation is not a technical, but a societal challenge. Client and builders should cooperate Less thinking in projects, more in markets and new opportunities for an innovation. Changing the reward system. The vision should shift; les project thinking. Thinking about continuous product and service provision. More focus on the end-user. Genera shared commitment towards innovation. More collaboration in the branch. Creating one innovation agenda Educate the end-user.
Why is innovation important?	Innovation, and selling your innovations, can create a financial baseline that makes the organization stronger and more stable.	Part of a modern organization Staying relevant	Societal relevance; increase customer value.
The pros and cons of innovation	Pros: revenue Cons: risks, investments	Pros: Cons: risks, costs	
The concept Corporate Entrepreneurship			
The current amount of Corporate Entrepreneurship in the organization	There are few possibilities for 'normal' employees to develop new ideas. It is very difficult to create an innovative culture.	Entrepreneurship and innovation are part of the organizational strategy Top Management is focused on Entrepreneurship All organizational members have the possibility to develop new ideas	An innovative culture is very important if you want to be innovative.
How do you create an innovative and entrepreneurial culture?	Top management should provide opportunity, space, and urgency to its employees to be innovative. Corporate pride A good vision Top Management is innovative Change the reward system	More flexibility Top Management support Provide resources Propagate innovation and entrepreneurship.	Changing a culture takes 5-10 years. Young people that want change The reward system Financial aid Recourses to innovate Not selling a 'what' but a 'why'.

Appendix F Coding of surveys

Survey one

Question	Code
De organisatiestructuur zo inrichten dat deze ruimte biedt voor innovatie	Q1.1
Flexibiliteit in de organisatiestructuur (op het gebied van ruimte, planning, financiën e.d.)	Q1.2
De organisatie draagt middelen aan om innovatieve activiteiten van medewerkers te stimuleren (o.a. financiële middelen en kennis)	Q1.3
De organisatie tolereert fouten van medewerkers	Q1.4
Conflicten tussen medewerkers worden geaccepteerd en constructief afgehandeld.	Q1.5
De organisatie stimuleert een kritische blik bij medewerkers omtrent de status quo (gebruikelijke gang van zaken) binnen het bedrijf.	Q.16
Het bedrijf gebruikt projecten om innovaties (product, service, proces) te testen en te implementeren.	Q1.7
In het selecteren van projecten wordt rekening gehouden met de potentiële kansen die het project biedt op gebied van innovatie en vernieuwing.	Q1.8
Er worden business cases ontwikkeld (inventarisatie van voor- en nadelen van een project, en de projectrisico's) en de projectinrichting worden op deze analyses gebaseerd.	Q1.9
De projectplanning laat ruimte over voor innovatieve activiteiten tijdens een project.	Q1.10
Topmanagement ondersteunt en stimuleert innovatie en ondernemerschap.	Q1.11
Het bedrijf vergaart actief kennis over trends en gebeurtenissen in de omgeving van de organisatie.	Q1.12
Het bedrijf onderhoudt de contacten in zijn netwerk actief (leveranciers, klanten, concurrenten).	Q1.13
Ondernemerschap komt duidelijk en expliciet naar voren in de visie van het bedrijf	Q1.14
Een ondernemende houding en het uitvoeren van ondernemende activiteiten maakt integraal deel uit van de organisatiecultuur	Q1.15
Medewerkers voelen zich aangetrokken tot het uitvoeren van ondernemende activiteiten.	Q1.16
De organisatie stimuleert en moedigt een ondernemende houding aan bij zijn medewerkers.	Q1.17
De organisatie biedt middelen aan (financieel, tijd, kennis e.d.) medewerkers om ondernemende acties uit te voeren.	Q1.18
Experts in de organisatie bieden relevante kennis en deze experts zijn bereikbaar voor medewerkers.	Q1.19
Medewerkers worden gestimuleerd om risico's te nemen als het gaat om het ontwikkelen van nieuwe ideeën.	Q1.20
In de beoordeling van het functioneren van medewerkers wordt innovatie en ondernemerschap meegenomen	Q1.21
De opdrachtgever maakt ruimte voor innovatie binnen het project, door dit als wens of eis op te nemen in de aanbesteding.	Q1.22
Het uitvoeren van meer R&D (research and development) activiteiten.	Q1.23
Het promoten en mogelijk maken van integratie in de keten.	Q1.24
Hebt u nog aanvullende maatregelen die individuele bedrijven kunnen nemen om de innovatiekracht van het bedrijf te vergroten? Geef deze dan hieronder aan:	Q1.25
Hebt u nog aanvullende maatregelen die de innovatiekracht van de bouwsector positief zouden kunnen beïnvloeden? Geef ze dan hieronder aan:	Q1.26

Survey two

Question	Code
Categorie: eerder bevraagde maatregelen en factoren	
De organisatiestructuur zo inrichten dat deze ruimte biedt voor innovatie	Q1.1
Flexibiliteit in de organisatiestructuur (op het gebied van ruimte, planning, financiën e.d.)	Q1.2
De organisatie draagt middelen aan om innovatieve activiteiten van medewerkers te stimuleren (o.a. financiële middelen en kennis)	Q1.3
De organisatie tolereert fouten van medewerkers	Q1.4
Conflicten tussen medewerkers worden geaccepteerd en constructief afgehandeld.	Q1.5
De organisatie stimuleert een kritische blik bij medewerkers omtrent de status quo (gebruikelijke gang van zaken) binnen het bedrijf.	Q.16
Het bedrijf gebruikt projecten om innovaties (product, service, proces) te testen en te implementeren.	Q1.7
In het selecteren van projecten wordt rekening gehouden met de potentiële kansen die het project biedt op gebied van innovatie en vernieuwing.	Q1.8
Er worden business cases ontwikkeld (inventarisatie van voor- en nadelen van een project, en de projectrisico's) en de projectinrichting worden op deze analyses gebaseerd.	Q1.9
De projectplanning laat ruimte over voor innovatieve activiteiten tijdens een project.	Q1.10
Topmanagement ondersteunt en stimuleert innovatie en ondernemerschap.	Q1.11
Het bedrijf vergaart actief kennis over trends en gebeurtenissen in de omgeving van de organisatie.	Q1.12
Het bedrijf onderhoudt de contacten in zijn netwerk actief (leveranciers, klanten, concurrenten).	Q1.13
Ondernemerschap komt duidelijk en expliciet naar voren in de visie van het bedrijf	Q1.14
Een ondernemende houding en het uitvoeren van ondernemende activiteiten maakt integraal deel uit van de organisatiecultuur	Q1.15
Medewerkers voelen zich aangetrokken tot het uitvoeren van ondernemende activiteiten.	Q1.16
De organisatie stimuleert en moedigt een ondernemende houding aan bij zijn medewerkers.	Q1.17
De organisatie biedt middelen aan (financieel, tijd, kennis e.d.) medewerkers om ondernemende acties uit te voeren.	Q1.18
Experts in de organisatie bieden relevante kennis en deze experts zijn bereikbaar voor medewerkers.	Q1.19
Medewerkers worden gestimuleerd om risico's te nemen als het gaat om het ontwikkelen van nieuwe ideeën.	Q1.20
In de beoordeling van het functioneren van medewerkers wordt innovatie en ondernemerschap meegenomen	Q1.21
De opdrachtgever maakt ruimte voor innovatie binnen het project, door dit als wens of eis op te nemen in de aanbesteding.	Q1.22
Het uitvoeren van meer R&D (research and development) activiteiten.	Q1.23
Het promoten en mogelijk maken van integratie in de keten.	Q1.24
Categorie: toegevoegde maatregelen en factoren naar aanleiding van eerste vragenlijst	
Inspirerende voorbeelden onder de aandacht brengen	Q2.1
Het constant opleiden van nieuwe- en bestaande professionals (reflective practinioner/ leven lang leren)	Q2.2
Contact tussen verschillende generaties stimuleren; jonge, nieuwe en ervaren medewerkers denken allen mee over innovatie.	Q2.3
Het meetbaar maken van innovatie	Q2.4
Categorie: Barrières voor innovatie	
Een bouwproject is vaak gefragmenteerd; de verschillende fasen in een project zijn grotendeels van elkaar gescheiden (in tijd, mensen, financiering, e.d.).	Q3.1
De markt structuur in de bouw (concurrentieveld, complexiteit van product etc.)	Q3.2
De opdrachtgever heeft een dominante rol in de project definitie, en dus op de grootte van mogelijkheden om innovatief te zijn binnen een project.	Q3.3
Er is niet genoeg coördinatie en samenspraak tussen wetenschap en praktijk.	Q3.4
Afhankelijkheid van de economische omstandigheden, die op dit moment slecht zijn, zorgt voor een gebrek aan innovatie.	Q3.5
De kosten die gemoeid zijn met het doen van onderzoek.	Q3.6
Beperkingen die opgelegd worden door wet- en regelgeving.	Q3.7
De traditionele contract vormen die vaak gebruikt worden bij bouwprojecten.	Q3.8
Investeringen in onderzoek zijn (in de sector als geheel) beperkt.	Q3.9
In het algemeen is er weinig gevoel van urgentie over innovatie in de bouw.	Q3.10
Er is vaak een gebrek aan erkenningen, promotie, en beloning van creativiteit, kwaliteit van werken en innovatie.	Q3.11
De bouw is een project industrie.	Q3.12
Categorie: afsluitende vragen	
Mocht u in de tussentijd nog vragen of opmerkingen hebben, neemt u dan vooral contact op via p.a.snijders@student.tue.nl op plaats uw opmerking hier:	Q4.1
Mag er contact met u worden gezocht naar aanleiding van uw antwoorden op deze enquête? (Bijvoorbeeld als u een erg afwijkende mening heeft, of interessante opmerkingen heeft geplaatst?)	Q4.2
Na het verwerken van de enquête en het maken van de benchmarks vindt er een vervolg onderzoek plaats naar de onderlinge relaties tussen de hier onderzochte maatregelen en factoren. Wilt u op de hoogte gehouden worden van het vervolg onderzoek naar de rol van ondernemerschap in innovatie in de bouw?	Q4.3

Appendix G Survey one

This appendix shows several characteristics of the first survey, and the way it was presented to the respondents.

H.1 The article as shown on the webpage of Bouwend Nederland

Link: http://www.bouwendnederland.nl/nieuws/1750275/onderzoek-innovatie-in-de-bouw--doe-mee

Nieuws en actualiteit | Thema's | Feiten en cijfers | Publicaties | Bouwweer | Ledenvoordelen | Word nu lid | Vereniging

U bent hier: Home › Nieuws › Onderzoek innovatie in de bouw doe mee

Onderzoek: Innovatie in de bouw - doe mee!

Door Arjan Wallinga , 22 oktober 2015

Samen met de Technische Universiteit Eindhoven onderzoekt Bouwend Nederland de rol van ondernemerschap bij innovaties. Het onderzoekt probeert antwoorden te vinden op vragen zoals 'welke organisatorische factoren spelen een rol in het ontwikkelen van innovatie? En van welk belang is een ondernemende houding bij werknemers als het gaat om het stimuleren van innovatie?'

Kapers op de kust
Vanuit de klant wordt steeds meer om 'intelligente gebouwen' gevraagd. De ICT component maakt een steeds groter onderdeel uit van de bouwsom en de partij die de ICT voor zijn rekening neemt, wordt steeds belangrijker in het bouwproces. Er gaan waarschuwingen rond dat op termijn deze partijen hoofdaannemers van een project worden, terwijl bouwbedrijven enkel een klein aandeel voor hun rekening mogen nemen en geen koppositie meer kunnen innemen. Om deze beweging tegen te kunnen gaan is innovatie van groot belang.

Siemens
Siemens is in Nederland vooral bekend om zijn huishoudelijke apparaten. Toch is het een bedrijf dat de bouw in de gaten moet houden. Zo is er het project 'Westermeerwind'. Siemens bouwt hier voor enkele honderden miljoenen euro's windturbines in de Noordoostpolder.
In dit soort grote projecten is Siemens de hoofdaannemer, en zijn bouwbedrijven de onderaannemers.

ABB
ABB is een internationaal bedrijf wat vooral actief is op het gebied van automatisering en energie. Het bedrijf haalde in 2014 een omzet van 40 miljard dollar (bijna 35 miljard euro). Hoewel bouwen niet tot de kernactiviteiten van ABB behoort, richt het bedrijf zich toch steeds meer op een deel van deze markt. ABB speelt bijvoorbeeld in op de toenemende klantvraag naar een 'smart home'; het aanbieden van comfort door een huis van geavanceerde technologie te voorzien.

Klik hier om direct mee te doen met de enquête over innovatie in de bouw.

Het vermoeden bestaat dat een ondernemende bedrijfscultuur en -structuur een significante bijdrage kan leveren aan de innovatiekracht van een bouwbedrijf. Dit vermoeden wordt getoetst door medewerkers te enquêteren die een sleutelpositie in een bouwbedrijf innemen of zich bezighouden met innovatie. Voor deze enquêtes zijn wij op zoek naar mensen die:

* Deel zijn van het top management of innovatie management van een bouwbedrijf in Nederland;

* Werkzaam zijn in een middelgroot of grote organisatie (jaaromzet ≥25 miljoen euro);

* Innovatie in de bouw belangrijk vinden en er graag meer over leren.

Herkent u zich in deze omschrijving? Doe dan mee aan dit onderzoek! Op die manier draagt u bij aan de kennis over het stimuleren van innovatie in de bouw en krijgt u een benchmark van de houding van uw organisatie ten opzicht van de hele sector (zie afbeelding).

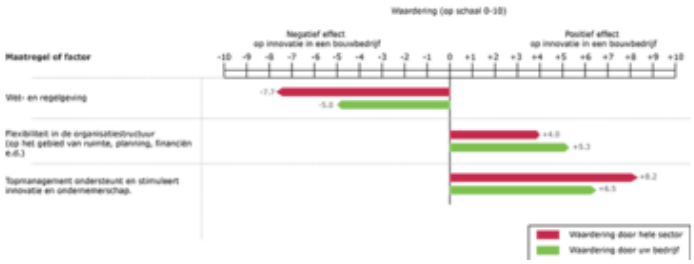
Deelname kost u eenmaal 5 en eenmaal 10 minuten. Het onderzoek bestaat uit twee enquêterondes. In de eerste ronde krijgt u een aantal maatregelen en factoren voorgelegd. Hiervan kunt u aangeven of ze een positief, geen, of negatief effect hebben op innovatie in de bouw. In de tweede ronde worden de door u als effectief beoordeelde maatregelen en factoren voorgelegd, die u dan een bepaald gewicht kunt toekennen.

Hoe meer mensen van uw bedrijf meedoen aan het onderzoek, hoe beter de benchmark uw bedrijf representeert. Nodig dus ook collega's uit om deel te nemen!

Klik hier om direct mee te doen met de enquête over innovatie in de bouw.

Het onderzoek wordt uitgevoerd in samenwerking met de Technische Universiteit Eindhoven.

Voorbeeld van resultaat na het invullende van beide enquêtes - benchmark uw bedrijf



H.2 The survey

Link: https://nl.surveymonkey.com/r/JXF53L8

Innovatie in de bouw

Introductie

Invullen: 5-10 min.

In deze vragenlijst wordt u een aantal maatregelen (met uitleg) voorgelegd. Bij elk van deze maatregelen kunt u aangeven of deze volgens u een positief, negatief of geen effect heeft op innovatie in de bouw.

Uw mening helpt bij het inzichtelijk maken van hoe de bouw innovatiever kan worden. Het invullen van deze enquête neemt ongeveer 5 minuten in beslag. Over enkele weken wordt u een tweede vragenlijst toegestuurd. Deze tweede enquête neemt ongeveer 10 minuten in beslag. Voor het onderzoek is het van belang dat u beide vragenlijsten compleet invult.

Er zijn twee categorieën vragen:
1) Organisatiestructuur en -cultuur
U ziet een aantal maatregelen die individuele bouwbedrijven zouden kunnen nemen om innovatie te bevorderen. U kunt van deze maatregelen aangeven of ze volgens u een positief effect, geen effect, of een negatief effect hebben op de innovatiekracht van het bedrijf. Als u van mening bent dat de maatregel niet genomen kan worden in de bouw, antwoordt u 'kan niet'.

2) Het stimuleren van innovatie
U ziet een aantal maatregelen die de bouwsector als geheel zou kunnen nemen om innovatie te bevorderen. Hier geldt dezelfde scoringsmethodiek: u kunt van deze maatregelen aangeven of ze volgens u een positief effect, geen effect, of een negatief effect hebben op de innovatiekracht van het bedrijf. Als u van mening bent dat de maatregel niet genomen kan worden in de bouw, antwoordt u 'kan niet'.

Let op!
Leest u deze a.u.b. onderstaande punten goed door voordat u aan de vragenlijst begint.
1. De vragen gelden voor bouwactiviteiten uitgevoerd in Nederland.
2. Een ondernemende houding houdt in dat medewerkers letten op nieuwe kansen en deze kansen ook actief proberen te benutten als ze zich voordoen.
3. Ondernemende activiteiten staat voor het uitvoeren van activiteiten rond het vertalen van kansen en innovaties naar praktische toepassingen.
4. Sommige maatregelen of karakteristieken lijken duidelijk voor zich te spreken; hun effect en aanwezigheid is algemeen geaccepteerd. Toch moeten deze door u worden beoordeeld, omdat er te weinig wetenschappelijk onderzoek is gedaan naar de bouw in Nederland om hier een wetenschappelijk verantwoorde uitspraak over te doen. Daarom wil ik u vragen de moeite te nemen deze toch te waarderen met positief effect/ geen effect/ negatief effect/ kan niet.

Aan het einde van elke categorie is er ruimte om aanvullende maatregelen aan te geven die invloed zouden hebben op de innovatiekracht van een bouwbedrijf.

1 / 5 20%

Volgende

Innovatie in de bouw

Organisatie structuur en cultuur

Geef van onderstaande maatregelen en factoren aan of ze een positief, geen, of een negatief effect hebben op de innovatie kracht van een bouwbedrijf. Als u denkt dat de maatregel niet genomen kan worden in de bouw, antwoord dan 'kan niet'.

* **Organisatiestructuur en -cultuur**

	Negatief effect	Geen effect	Positief effect	Kan niet
De organisatiestructuur zo inrichten dat deze ruimte biedt voor innovatie	○	○	○	○
Flexibiliteit in de organisatiestructuur (op het gebied van ruimte, planning, financiën e.d.)	○	○	○	○
De organisatie draagt middelen aan om innovatieve activiteiten van medewerkers te stimuleren (o.a. financiële middelen en kennis).	○	○	○	○
De organisatie tolereert fouten van medewerkers	○	○	○	○
Conflicten tussen medewerkers worden geaccepteerd en constructief afgehandeld.	○	○	○	○
De organisatie stimuleert een kritische blik bij medewerkers omtrent de status quo (gebruikelijke gang van zaken) binnen het bedrijf.	○	○	○	○
Het bedrijf gebruikt projecten om innovaties (product, service, proces) te testen en te implementeren.	○	○	○	○
In het selecteren van projecten wordt rekening gehouden met de potentiële kansen die het project biedt op gebied van innovatie en vernieuwing.	○	○	○	○
Er worden business cases ontwikkeld (inventarisatie van voor- en nadelen van een project, en de projectrisico's) en de projectinrichting worden op deze analyses gebaseerd.	○	○	○	○
De projectplanning laat ruimte over voor innovatieve activiteiten tijdens een project.	○	○	○	○
Topmanagement ondersteunt en stimuleert innovatie en ondernemerschap.	○	○	○	○
Het bedrijf vergaart actief kennis over trends en gebeurtenissen in de omgeving van de organisatie.	○	○	○	○
Het bedrijf onderhoudt de contacten in zijn netwerk actief (leveranciers, klanten, concurrenten).	○	○	○	○
Ondernemerschap komt duidelijk en expliciet naar voren in de visie van het bedrijf.	○	○	○	○

Appendix H Attributes evaluated in survey one

Question
De organisatiestructuur zo inrichten dat deze ruimte biedt voor innovatie
Flexibiliteit in de organisatiestructuur (op het gebied van ruimte, planning, financiën e.d.)
De organisatie draagt middelen aan om innovatieve activiteiten van medewerkers te stimuleren (o.a. financiële middelen en kennis)
De organisatie tolereert fouten van medewerkers
Conflicten tussen medewerkers worden geaccepteerd en constructief afgehandeld.
De organisatie stimuleert een kritische blik bij medewerkers omtrent de status quo (gebruikelijke gang van zaken) binnen het bedrijf.
Het bedrijf gebruikt projecten om innovaties (product, service, proces) te testen en te implementeren.
In het selecteren van projecten wordt rekening gehouden met de potentiële kansen die het project biedt op gebied van innovatie en vernieuwing.
Er worden business cases ontwikkeld (inventarisatie van voor- en nadelen van een project, en de projectrisico's) en de projectinrichting worden op deze analyses gebaseerd.
De projectplanning laat ruimte over voor innovatieve activiteiten tijdens een project.
Topmanagement ondersteunt en stimuleert innovatie en ondernemerschap.
Het bedrijf vergaart actief kennis over trends en gebeurtenissen in de omgeving van de organisatie.
Het bedrijf onderhoudt de contacten in zijn netwerk actief (leveranciers, klanten, concurrenten).
Ondernemerschap komt duidelijk en expliciet naar voren in de visie van het bedrijf
Een ondernemende houding en het uitvoeren van ondernemende activiteiten maakt integraal deel uit van de organisatiecultuur
Medewerkers voelen zich aangetrokken tot het uitvoeren van ondernemende activiteiten.
De organisatie stimuleert en moedigt een ondernemende houding aan bij zijn medewerkers.
De organisatie biedt middelen aan (financieel, tijd, kennis e.d.) medewerkers om ondernemende acties uit te voeren.
Experts in de organisatie bieden relevante kennis en deze experts zijn bereikbaar voor medewerkers.
Medewerkers worden gestimuleerd om risico's te nemen als het gaat om het ontwikkelen van nieuwe ideeën.
In de beoordeling van het functioneren van medewerkers wordt innovatie en ondernemerschap meegenomen
De opdrachtgever maakt ruimte voor innovatie binnen het project, door dit als wens of eis op te nemen in de aanbesteding.
Het uitvoeren van meer R&D (research and development) activiteiten.
Het promoten en mogelijk maken van integratie in de keten.
Hebt u nog aanvullende maatregelen die individuele bedrijven kunnen nemen om de innovatiekracht van het bedrijf te vergroten? Geef deze dan hieronder aan:
Hebt u nog aanvullende maatregelen die de innovatiekracht van de bouwsector positief zouden kunnen beïnvloeden? Geef ze dan hieronder aan:

Appendix I Remarks with survey one

Innovation Manager I
Inspirerende voorbeelden onder de aandacht brengen.

Innovation Manager II
Alle genoemde aspecten zijn relevant. Maar niet overal, in alle projecten, zijn ze toepasbaar. Goed gericht maatwerk is daarom essentieel.

Innovation Manager III
Er moet een omgeving worden geschapen die innovatie stimuleert. Innovatie vindt alleen plaats bij bedrijven die beschikken over teveel overgekwalificeerd personeel. Die mensen houden naast het doen van hun dagelijkse werkzaamheden namelijk tijd over om na te denken over innovaties.

Innovation Manager IV
Vind het heel zwart-wit deze vragenlijst. Elke cultuur van elke organisatie. Je moet dus goed kijken welke maatregelen werken wel en welke niet in de organisatie. Innovatie organiseren is ook innovatie, wat gaat met vallen en opstaan. Opdrachtgever kan partijen laten samenwerken. Opdrachtgever moet niet voor de opdrachtnemer denken, maar minimale eisen/nullijnen neerleggen waar boven gepresteerd moet worden

Innovation Manager V
Het organiseren van inzicht/noodzaak en type innovatie vanuit de maatschappelijk context/urgentie (pull i.p.v. push innovatie). Het organiseren van de evaluatie-leercyclus bij het ontwikkelen, realiseren en beheren van innovaties. Het organiseren van de mogelijkheid innovaties t.o.v. elkaar te vergelijken. Het organiseren van de open innovatie; het gezamenlijk ontwikkelen/realiseren/beheren van kennis m.b.t. de innovatie in de tripple-helix context (overheid - organisaties/bedrijven- kennisinstellingen)
Wat is de reden voor innovatie? Hoe is de relatie van de innovatie (aard/type_ m.b.t. de maatschappelijke/ opdrachtgever(s)/gebruiker(s)?. Welke type kennis/partners (binnen en/of buiten de keten) zijn hiervoor nodig (in kader van vorig punt). De opleidingskant; wat tevens moet> het introduceren en opleiden van nieuwe- en bestaande professionals vanuit het voorgaande (het waarom) en vervolgens wat/wie en hoe - dit in een doorgaande leercyclus (second loop learning + reflective practitioner).

Innovation Manager VI
Actief zijn in en contacten onderhouden met andere (vergelijkbare) branches - binnen personeelsbestand/ afdelingen ''evenwichtige" vertegenwoordiging vanuit verschillende generaties - competentie i.p.v. functiegericht - aandacht voor een sluitende cirkel specifiek gericht op innovatie - aandacht voor het meetbaar maken van de effecten van innovatie
Kennisdelen. Leven lang leren.

Top manager I
Minder traditioneel vergaderen in een bedrijf. Mensen trainen in het stellen van vragen aan elkaar en in het accepteren van vragen.
Opdrachtgevers moeten 'de lat' hoger leggen en meer eisen. Opdrachtgevers moeten minder vragen naar bewezen technieken, ruimte laten voor ontwikkelingen en daarvoor garanties vragen. Geïntegreerde contracten zijn een voorwaarde hiervoor

Top manager II
Geef jonge mensen een kans

Top manager III
Verbeteren en innoveren vanuit de projecten. Innovaties koppelen aan een duidelijke visie op je verdienmodel. Innovaties dienen bedrijfsmatig aan elkaar worden verbonden.
Innovatie laat zich niet sturen door een opdrachtgever. Wat voor de een innovatie is, is voor de ander onderdeel van de bedrijfsvoering. Innovatie moet leiden tot meer bussiness door een hogere kwaliteit of een lagere prijs.

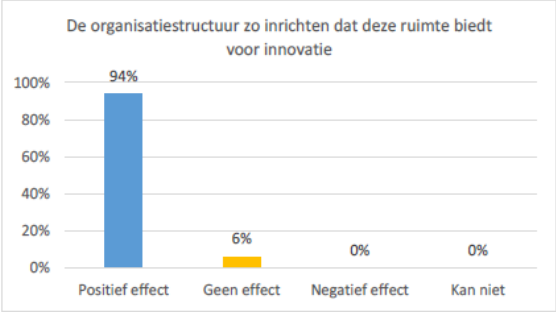
Top manager IV
Organiseer innovatie naast de bestaande structuur
Niet alleen prijs doorslaggevend laten zijn

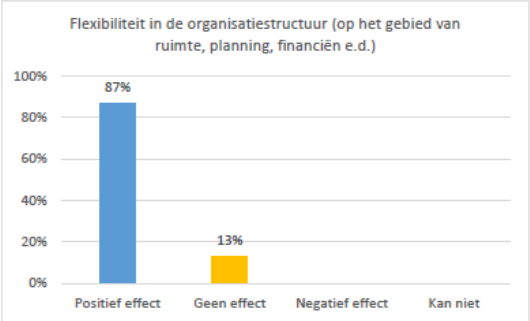
Top manager V
Samenwerking aangaan met startup bedrijven die innovatie kunnen versnellen

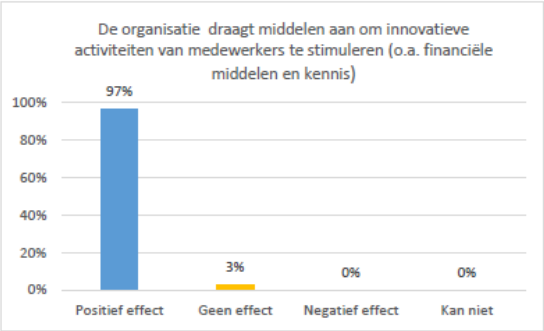
Appendix J Responds survey one

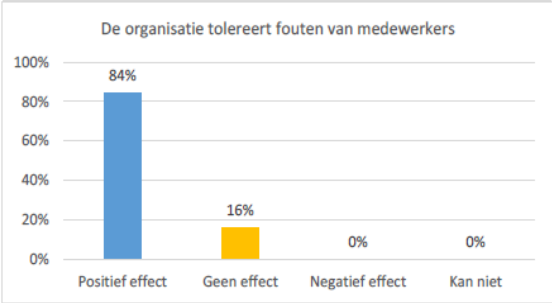
ID nr.	Categorie	Functie	Vraag code																							
			Q1.1	Q1.2	Q1.3	Q1.4	Q1.5	Q1.6	Q1.7	Q1.8	Q1.9	Q1.10	Q1.11	Q1.12	Q1.13	Q1.14	Q1.15	Q1.16	Q1.17	Q1.18	Q1.19	Q1.20	Q1.21	Q1.22	Q1.23	Q1.24
1	IM	Manager Business Development	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
2	IM	BIM Specialist	+1	+1	+1	+1	0	+1	+1	0	0	+1	+1	0	0	0	0	+1	+1	+1	0	+1	+1	0	+1	+1
3	IM	Innovatiemanager	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
4	IM	BIM Specialist	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
5	IM	Business Developer	+1	0	+1	+1	+1	0	+1	+1	+1	kn	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
6	IM	Landelijk Manager Inkoop	+1	+1	+1	+1	+1	+1	0	+1	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
7	IM	Senior Adviseur	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
8	IM	Adviseur Innovatie	+1	+1	+1	+1	0	+1	+1	0	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
9	IM	Regio coordinator SSB	+1	+1	+1	0	0	+1	+1	+1	+1	kn	+1	+1	+1	0	0	0	0	0	+1	+1	+1	kn	+1	0
10	IM	Managing Director	+1	+1	+1	+1	+1	+1	0	+1	-1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
11	IM	Innovatiemanager	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	kn	kn
12	IM	Coordinator en innovaties	+1	0	+1	+1	+1	+1	+1	0	-1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	-1	0	+1	+1	+1
13	IM	Manager duurzaamheid	+1	+1	+1	+1	0	0	+1	0	0	0	+1	+1	+1	0	+1	0	+1	+1	+1	0	0	+1	+1	+1
14	IM	Lector en Senior Designer	+1	+1	+1	0	0	+1	+1	+1	+1	+1	+1	+1	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
15	IM	Senior planontwikkelaar	+1	+1	+1	+1	+1	+1	+1	+1	0	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	0	+1	+1	+1	+1
16	TM	Directeur	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
17	TM	Voormalig directeur en emeritus professor	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
18	TM	Directeur	+1	+1	+1	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	kn	+1	+1	+1
19	TM	DGA	0	0	0	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	kn	+1	0
20	TM	Directeur	+1	+1	+1	0	0	+1	+1	0	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	0	0	-1	+1	+1
21	TM	Directeur	+1	0	+1	+1	+1	+1	+1	+1	0	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
22	TM	Algemeen Directeur	+1	+1	+1	+1	+1	+1	0	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	0	+1	+1	+1	+1
23	TM	Algemeen Directeur	+1	+1	+1	0	kn	+1	+1	+1	0	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	kn	+1	+1	+1	+1
24	TM	Hoofd productie	+1	+1	+1	+1	0	+1	+1	+1	+1	-1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
25	TM	Directeur strategie en innovatie	+1	+1	+1	+1	0	0	+1	0	+1	0	+1	+1	+1	+1	0	0	+1	+1	+1	+1	+1	+1	+1	0
26	TM	Algemeen Directeur	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	kn	+1	+1

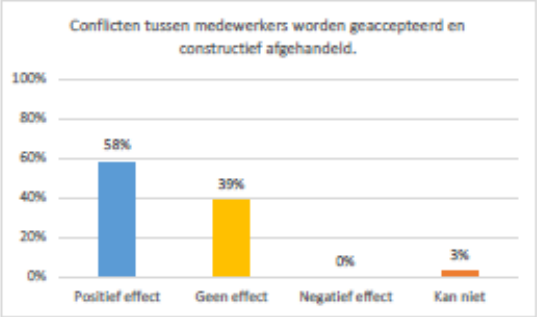
Appendix K Graphs survey one

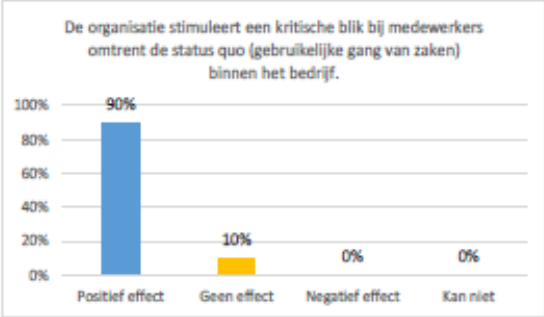


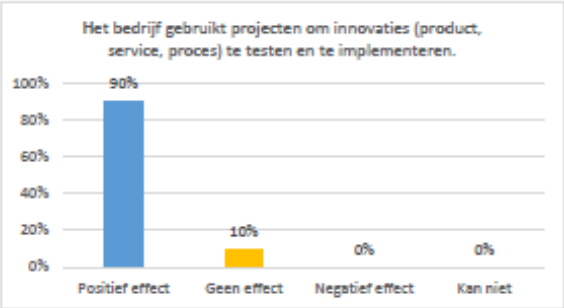


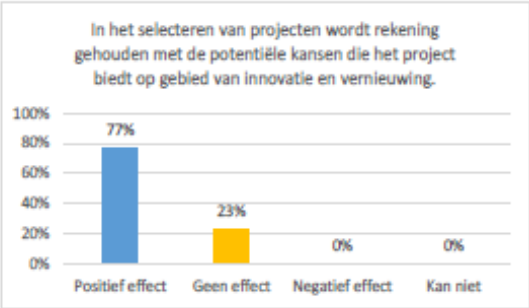


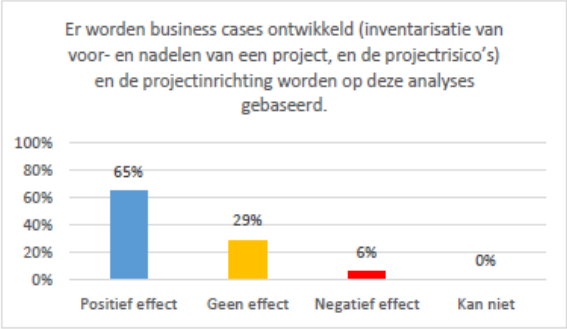


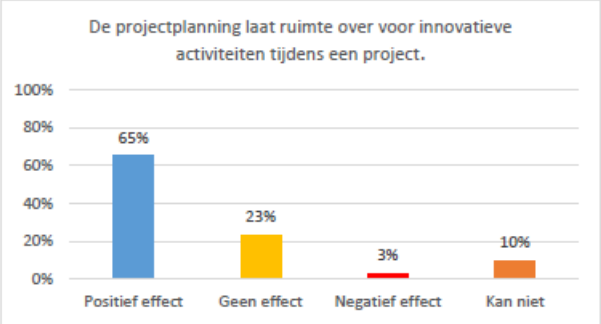


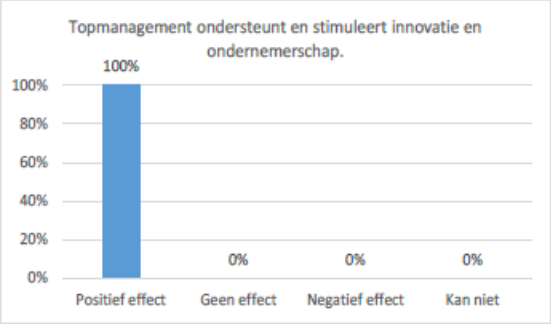


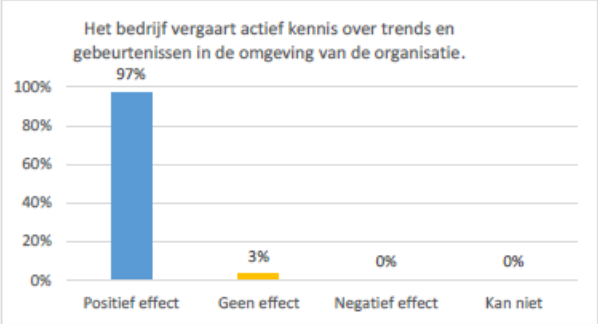


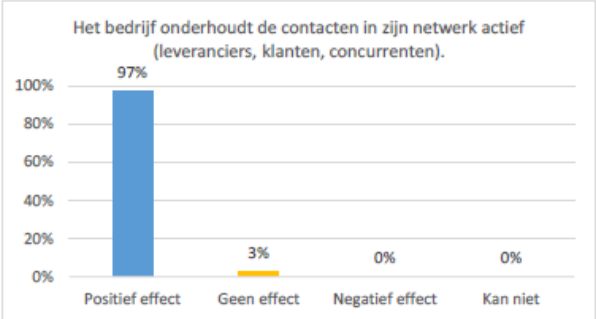


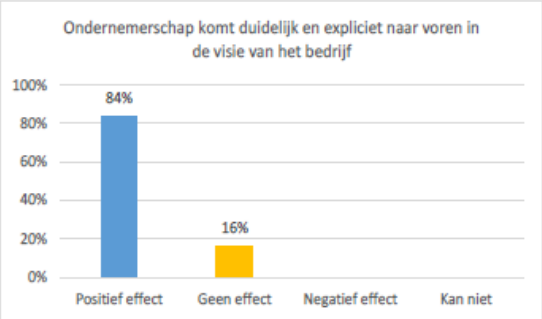

Er worden business cases ontwikkeld (inventarisatie van voor- en nadelen van een project, en de projectrisico's) en de projectinrichting worden op deze analyses gebaseerd.
100%
80%
60%
40%
20%
0%
65%
29%
6%
0%
Positief effect
Geen effect
Negatief effect
Kan niet

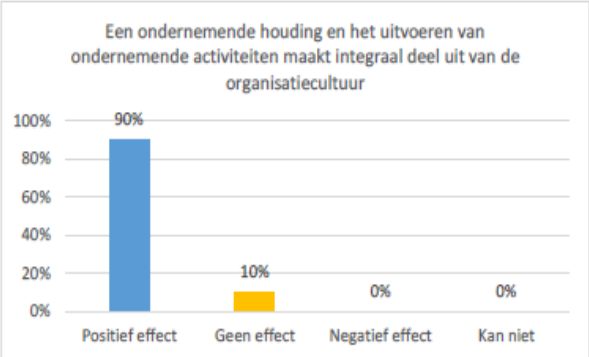

De projectplanning laat ruimte over voor innovatieve activiteiten tijdens een project.
100%
80%
60%
40%
20%
0%
65%
23%
3%
10%
Positief effect
Geen effect
Negatief effect
Kan niet

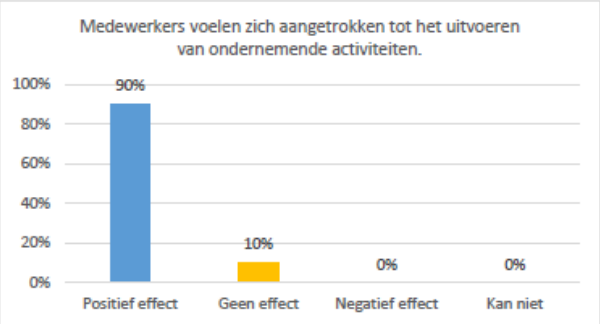

Topmanagement ondersteunt en stimuleert innovatie en ondernemerschap.
100%
80%
60%
40%
20%
0%
100%
0%
0%
0%
Positief effect
Geen effect
Negatief effect
Kan niet

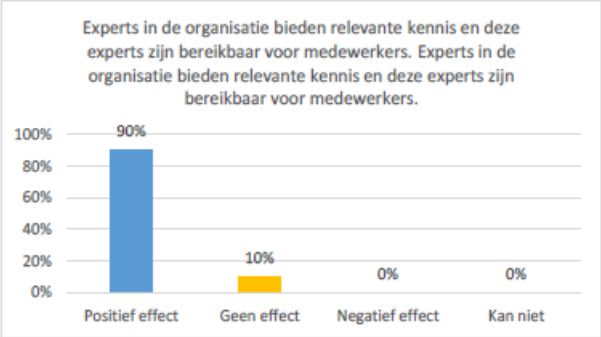

Het bedrijf vergaart actief kennis over trends en gebeurtenissen in de omgeving van de organisatie.
100%
80%
60%
40%
20%
0%
97%
3%
0%
0%
Positief effect
Geen effect
Negatief effect
Kan niet

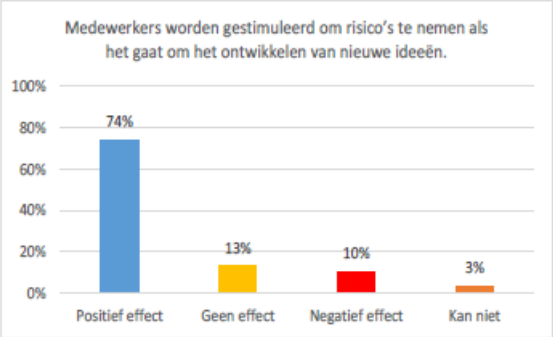

Het bedrijf onderhoudt de contacten in zijn netwerk actief (leveranciers, klanten, concurrenten).
100%
80%
60%
40%
20%
0%
97%
3%
0%
0%
Positief effect
Geen effect
Negatief effect
Kan niet

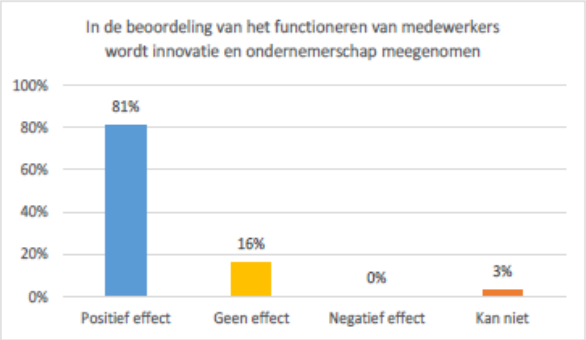

Ondernemerschap komt duidelijk en expliciet naar voren in de visie van het bedrijf
100%
80%
60%
40%
20%
0%
84%
16%
Positief effect
Geen effect
Negatief effect
Kan niet

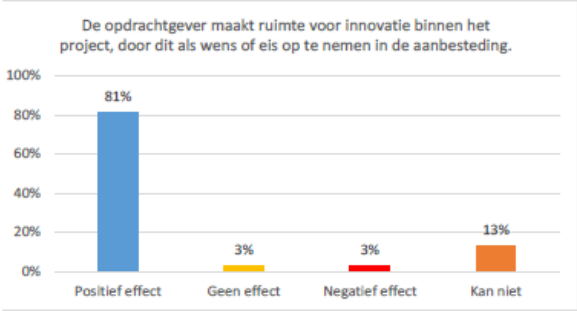

Een ondernemende houding en het uitvoeren van ondernemende activiteiten maakt integraal deel uit van de organisatiecultuur
100%
80%
60%
40%
20%
0%
90%
10%
0%
0%
Positief effect
Geen effect
Negatief effect
Kan niet

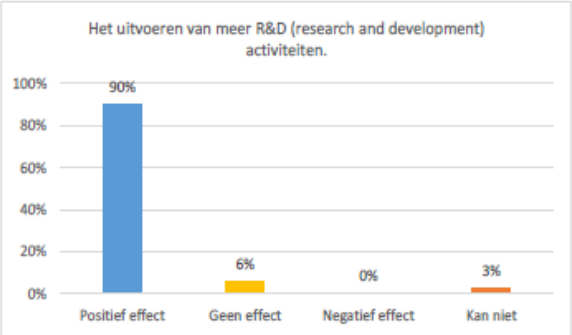

Medewerkers voelen zich aangetrokken tot het uitvoeren van ondernemende activiteiten.
100%
80%
60%
40%
20%
0%
90%
10%
0%
0%
Positief effect
Geen effect
Negatief effect
Kan niet

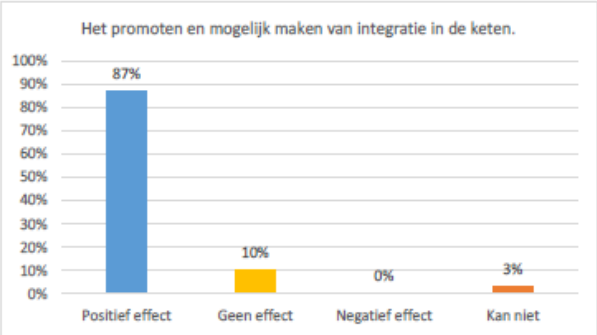

Experts in de organisatie bieden relevante kennis en deze experts zijn bereikbaar voor medewerkers. Experts in de organisatie bieden relevante kennis en deze experts zijn bereikbaar voor medewerkers.
100%
80%
60%
40%
20%
0%
90%
10%
0%
0%
Positief effect
Geen effect
Negatief effect
Kan niet


Medewerkers worden gestimuleerd om risico's te nemen als het gaat om het ontwikkelen van nieuwe ideeën.
100%
80%
60%
40%
20%
0%
74%
13%
10%
3%
Positief effect
Geen effect
Negatief effect
Kan niet


In de beoordeling van het functioneren van medewerkers wordt innovatie en ondernemerschap meegenomen
100%
80%
60%
40%
20%
0%
81%
16%
0%
3%
Positief effect
Geen effect
Negatief effect
Kan niet


De opdrachtgever maakt ruimte voor innovatie binnen het project, door dit als wens of eis op te nemen in de aanbesteding.
100%
80%
60%
40%
20%
0%
81%
3%
3%
13%
Positief effect
Geen effect
Negatief effect
Kan niet


Het uitvoeren van meer R&D (research and development) activiteiten.
100%
80%
60%
40%
20%
0%
90%
6%
0%
3%
Positief effect
Geen effect
Negatief effect
Kan niet


Het promoten en mogelijk maken van integratie in de keten.
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
87%
10%
0%
3%
Positief effect
Geen effect
Negatief effect
Kan niet

Appendix L Survey two

Innovatie in de bouw - ronde twee

Introductie

Invullen: 15-20 min.

Welkom bij het tweede deel van dit onderzoek naar innovatie in de bouw! Alvast hartelijk dank voor uw deelname.

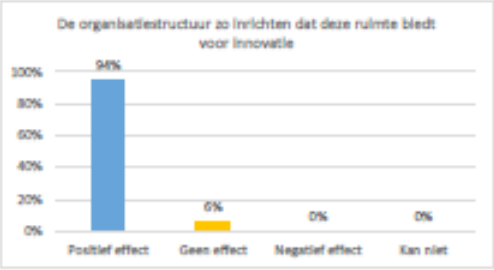
In deze vragenlijst worden u een aantal factoren en maatregelen voorgelegd die van invloed zijn op de innovatiekracht van een bouwbedrijf. Bij elke vraag kunt u aangeven hoe groot de invloed van de maatregel of factor is op innovatie in de bouw.

Omdat elk project, elk bedrijf, en elke situatie in de bouw anders is, kunt u bij elke vraag aangeven wat de minimale invloed, de maximale invloed, en de gemiddelde invloed van een bepaalde variabele is.

Er zijn 3 categorieën vragen:
1. Eerder beoordeelde maatregelen en factoren. Deze maatregelen en factoren zijn in de eerste vragenlijst door u beoordeeld op hun effect op innovatie in de bouw. Hier wordt verder op ingegaan door deze hier een gewicht toe te kennen (24 vragen).
2. Het stimuleren van innovatie. Deze categorie omhelst factoren die zijn aangedragen door respondenten (4 vragen).
3. Remmingen op innovatie in de bouw. Dit zijn factoren die een remmende werking op innovatie in de bouw hebben. Dat deze aanwezig zijn is algemeen bekend, maar het gewicht wat ze hebben is nog niet onderzocht (12 vragen).

Let op!
Leest u a.u.b. onderstaande punten goed door voordat u aan de vragenlijst begint.

1. Deze vragenlijst mag enkel worden ingevuld door mensen die hebben deelgenomen aan de eerste vragenlijst, dit om de wetenschappelijke validiteit van dit onderzoek te waarborgen.
2. In de eerste categorie vragen worden u variabelen voorgelegd die eerder door u zijn beoordeeld. Hierbij wordt er uitgegaan van het principe dat de meerderheid gelijk heeft; het antwoord wat bij de eerste vragenlijst meer dan 50% van de keren is gegeven, wordt als het goede aangemerkt (heeft 85% gekozen voor de optie 'positief effect', dan is de schaal ook positief). Gaat u hier a.u.b. vanuit. Kunt u zich niet vinden in de keuze van de meerderheid? Dan kunt u dat ook aangeven.



	0 Geen effect	1	2	3	4	5	6	7	8	9	10 Zeer positief effect
Minimaal effect	○	○	○	○	○	○	○	○	○	○	○
Gemiddeld effect	○	○	○	○	○	○	○	○	○	○	○
Maximaal effect	○	○	○	○	○	○	○	○	○	○	○

Deze variabele heeft geen positief effect maar...

○ Een negatief effect

○ Kan niet worden toegepast

Toelichting (optioneel):

	0 Geen effect	1	2	3	4	5	6	7	8	9	10 Zeer positief effect
Minimaal effect	○	○	○	○	○	○	○	○	○	○	○
Gemiddeld effect	○	○	○	○	○	○	○	○	○	○	○
Maximaal effect	○	○	○	○	○	○	○	○	○	○	○

Deze variabele heeft geen positief effect maar...

○ Een negatief effect

○ Kan niet worden toegepast

Toelichting (optioneel):

Appendix M Responds survey two

Attribute

1. The organisational structure creates room for innovation

Expert	min (a)	opt (b)	max (c)	(...;...;...;...)	(...;...;...;...)	Crisp value individual (Sj)
1	10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
2	2	4	8	(2;4;8)	(0,2;0,4;0,8)	0,433
3	9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
4	7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
5	9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
6	7	7	9	(7;7;9)	(0,7;0,7;0,9)	0,733
7	0	5	10	(0;5;10)	(0,0;0,5;1,0)	0,500
8	3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
9	3	7	9	(3;7;9)	(0,3;0,7;0,9)	0,667
10	4	7	7	(4;7;7)	(0,4;0,7;0,7)	0,650
11	2	6	7	(2;6;7)	(0,2;0,6;0,7)	0,550
12	7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
13	10	10	6	(10;10;6)	(1,0;1,0;0,6)	0,933
14	5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
15	6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
16	7	8	10	(7;8;10)	(0,7;0,8;1,0)	0,817
17	4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
18	8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
19	0	4	9	(0;4;9)	(0,0;0,4;0,9)	0,417
20	5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
21	5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,695238095	1	(0,000;0,695;1,000)	0,630	**Retain**

	Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
IM	0	0,710	1	(0,000;0,710;1,000)	0,640
TM	0	0,681818182	1	(0,000;0,682;1,000)	0,621

Expert	Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
1	1,000	0,640	0,630	0,360	0,370
2	0,433	0,640	0,630	-0,207	-0,197
3	0,900	0,640	0,630	0,260	0,270
4	0,800	0,640	0,630	0,160	0,170
5	0,900	0,640	0,630	0,260	0,270
6	0,733	0,640	0,630	0,093	0,103
7	0,500	0,640	0,630	-0,140	-0,130
8	0,500	0,640	0,630	-0,140	-0,130
9	0,667	0,640	0,630	0,027	0,037
10	0,650	0,640	0,630	0,010	0,020
11	0,550	0,621	0,630	-0,071	-0,080
12	0,700	0,621	0,630	0,079	0,070
13	0,933	0,621	0,630	0,312	0,303
14	0,700	0,621	0,630	0,079	0,070
15	0,717	0,621	0,630	0,095	0,087
16	0,817	0,621	0,630	0,195	0,187
17	0,600	0,621	0,630	-0,021	-0,030
18	0,800	0,621	0,630	0,179	0,170
19	0,417	0,621	0,630	-0,205	-0,213
20	0,500	0,621	0,630	-0,121	-0,130
21	0,700	0,621	0,630	0,079	0,070

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,538095238	0,695238095	0,828571429	(0,538;0,695;0,829)

2. Flexibility in the organizational structure (in space, planning, finance etc.)

min (a)	opt (b)	max (c)	(...;...;...;...)	(...;...;...;...)	Crisp value individual (Sj)
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
0	5	10	(0,5;10)	(0,0;0,5;1,0)	0,500
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
4	7	8	(4;7;8)	(0,4;0,7;0,8)	0,667
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
2	7	8	(2;7;8)	(0,2;0,7;0,8)	0,633
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
10	8	3	(10;8;3)	(1,0;0,8;0,3)	0,750
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
7	8	10	(7,8,10)	(0,7;0,8;1,0)	0,817
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
8	7	6	(8;7;6)	(0,8;0,7;0,6)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,661904762	1	(0,000;0,662;1,000)	0,608	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,63	1	(0,000;0,630;1,000)	0,587
0,2	0,690909091	1	(0,200;0,691;1,000)	0,661

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,700	0,587	0,608	0,113	0,092
0,517	0,587	0,608	-0,070	-0,091
0,600	0,587	0,608	0,013	-0,008
0,800	0,587	0,608	0,213	0,192
0,900	0,587	0,608	0,313	0,292
0,500	0,587	0,608	-0,087	-0,108
0,500	0,587	0,608	-0,087	-0,108
0,500	0,587	0,608	-0,087	-0,108
0,667	0,587	0,608	0,080	0,059
0,583	0,587	0,608	-0,003	-0,025
0,633	0,661	0,608	-0,027	0,025
0,700	0,661	0,608	0,039	0,092
0,750	0,661	0,608	0,089	0,142
0,600	0,661	0,608	-0,061	-0,008
0,600	0,661	0,608	-0,061	-0,008
0,817	0,661	0,608	0,156	0,209
0,500	0,661	0,608	-0,161	-0,108
0,700	0,661	0,608	0,039	0,092
0,900	0,661	0,608	0,239	0,292
0,500	0,661	0,608	-0,161	-0,108
0,800	0,661	0,608	0,139	0,192

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,547619048	0,661904762	0,738095238	(0,548;0,662;0,738)

3. The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge).

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
4	7	9	(4;7;9)	(0,4;0,7;0,9)	0,683
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
2	5	10	(2;5;10)	(0,2;0,5;1,0)	0,533
3	5	9	(3;5;9)	(0,3;0,5;0,9)	0,533
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
3	7	8	(3;7;8)	(0,3;0,7;0,8)	0,650
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
5	7	8	(5;7;8)	(0,5;0,7;0,8)	0,683
8	8	10	(8;8;10)	(0,8;0,8;1,0)	0,833
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
8	5	2	(8;5;2)	(0,8;0,5;0,2)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,695238095	1	(0,200;0,695;1,000)	0,663	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,71	1	(0,200;0,710;1,000)	0,673
0,3	0,681818182	1	(0,300;0,682;1,000)	0,671

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,673	0,663	0,127	0,137
0,683	0,673	0,663	0,010	0,020
0,700	0,673	0,663	0,027	0,037
0,900	0,673	0,663	0,227	0,237
0,900	0,673	0,663	0,227	0,237
0,900	0,673	0,663	0,227	0,237
0,533	0,673	0,663	-0,140	-0,130
0,533	0,673	0,663	-0,140	-0,130
0,400	0,673	0,663	-0,273	-0,263
0,800	0,673	0,663	0,127	0,137
0,650	0,671	0,663	-0,021	-0,013
0,700	0,671	0,663	0,029	0,037
0,500	0,671	0,663	-0,171	-0,163
0,800	0,671	0,663	0,129	0,137
0,683	0,671	0,663	0,012	0,020
0,833	0,671	0,663	0,162	0,170
0,700	0,671	0,663	0,029	0,037
0,500	0,671	0,663	-0,171	-0,163
0,900	0,671	0,663	0,229	0,237
0,500	0,671	0,663	-0,171	-0,163
0,700	0,671	0,663	0,029	0,037

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,614285714	0,695238095	0,780952381	(0,614;0,695;0,781)

4. The organization accepts mistakes from its members.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	8	10	(5;8;10)	(0,5;0,8;0,1)	0,783
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
2	5	8	(2;5;8)	(0,2;0,5;0,8)	0,500
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	7	10	(5;7;10)	(0,5;0,7;1,0)	0,717
5	7	7	(5;7;7)	(0,5;0,7;0,7)	0,667
3	8	8	(3;8;8)	(0,3;0,8;0,8)	0,717
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
6	8	10	(6;8;10)	(0,6;0,8;1,0)	0,800
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
2	6	8	(2;6;8)	(0,2;0,6;0,8)	0,567
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
2	2	2	(2;2;2)	(0,2;0,2;0,2)	0,200
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,661904762	1	(0,200;0,662;1,000)	0,641	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,680	1	(0,200;0,680;1,000)	0,653
0,2	0,645454545	1	(0,200;0,645;1,000)	0,630

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,653	0,641	0,247	0,259
0,783	0,653	0,641	0,130	0,142
0,500	0,653	0,641	-0,153	-0,141
0,800	0,653	0,641	0,147	0,159
0,700	0,653	0,641	0,047	0,059
0,717	0,653	0,641	0,063	0,075
0,500	0,653	0,641	-0,153	-0,141
0,517	0,653	0,641	-0,137	-0,125
0,717	0,653	0,641	0,063	0,075
0,667	0,653	0,641	0,013	0,025
0,717	0,630	0,641	0,086	0,075
0,600	0,630	0,641	-0,030	-0,041
0,500	0,630	0,641	-0,130	-0,141
0,600	0,630	0,641	-0,030	-0,041
0,583	0,630	0,641	-0,047	-0,058
0,800	0,630	0,641	0,170	0,159
0,600	0,630	0,641	-0,030	-0,041
0,567	0,630	0,641	-0,064	-0,075
1,000	0,630	0,641	0,370	0,359
0,200	0,630	0,641	-0,430	-0,441
0,800	0,630	0,641	0,170	0,159

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,523809524	0,661904762	0,761904762	(0,524;0,662;0,762)

5. Conflict between members in accepted and dealt with constructively.

min (a)	opt (b)	max (c)	(...;...;...;...)	(...;...;...;...)	Crisp value individual (Sj)
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
0	2	4	(0;2;4)	(0,0;0,2;0,4)	0,200
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
5	5	6	(5;5;6)	(0,5;0,5;0,6)	0,517
2	6	10	(2;6;10)	(0,2;0,6;1,0)	0,600
4	5	7	(4;5;7)	(0,4;0,5;0,7)	0,517
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
1	6	8	(1;6;8)	(0,1;0,6;0,8)	0,550
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
3	5	6	(3;5;6)	(0,3;0,5;0,6)	0,483
5	7	8	(5;7;8)	(0,5;0,7;0,8)	0,683
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	6	4	(8;6;4)	(0,8;0,6;0,4)	0,600
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,5	1	(0,000;0,500;1,000)	0,500	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,5100	1	(0,000;0,510;1,000)	0,507
0	0,490909091	0,8	(0,000;0,491;0,800)	0,461

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,600	0,507	0,500	0,093	0,100
0,200	0,507	0,500	-0,307	-0,300
0,600	0,507	0,500	0,093	0,100
0,700	0,507	0,500	0,193	0,200
0,300	0,507	0,500	-0,207	-0,200
0,517	0,507	0,500	0,010	0,017
0,600	0,507	0,500	0,093	0,100
0,517	0,507	0,500	0,010	0,017
0,600	0,507	0,500	0,093	0,100
0,500	0,507	0,500	-0,007	0,000
0,550	0,461	0,500	0,089	0,050
0,600	0,461	0,500	0,139	0,100
0,500	0,461	0,500	0,039	0,000
0,600	0,461	0,500	0,139	0,100
0,483	0,461	0,500	0,023	-0,017
0,683	0,461	0,500	0,223	0,183
0,000	0,461	0,500	-0,461	-0,500
0,600	0,461	0,500	0,139	0,100
0,800	0,461	0,500	0,339	0,300
0,500	0,461	0,500	0,039	0,000
0,000	0,461	0,500	-0,461	-0,500

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,414285714	0,5	0,571428571	(0,414;0,500;0,571)

6. The organization stimulates a critical attitude from members towards the status quo.

min (a)	opt (b)	max (c)	(...;...;...;...)	(...;...;...;...)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
6	8	10	(6;8;10)	(0,6;0,8;0,1)	0,800
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
1	3	4	(1;3;4)	(0,1;0,3;0,4)	0,283
1	6	10	(1;6;10)	(0,1;0,6;1,0)	0,583
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	7	8	(4;7;8)	(0,4;0,7;0,8)	0,667
6	7	6	(6;7;6)	(0,6;0,7;0,6)	0,667
3	8	9	(3;8;9)	(0,3;0,8;0,9)	0,733
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
3	7	9	(3;7;9)	(0,3;0,7;0,9)	0,667
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,666666667	1	(0,100;0,667;1,000)	0,628	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,670	1	(0,100;0,670;1,000)	0,630
0,3	0,663636364	0,9	(0,300;0,664;0,900)	0,642

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,630	0,628	0,170	0,172
0,800	0,630	0,628	0,170	0,172
0,600	0,630	0,628	-0,030	-0,028
0,883	0,630	0,628	0,253	0,256
0,800	0,630	0,628	0,170	0,172
0,283	0,630	0,628	-0,347	-0,344
0,583	0,630	0,628	-0,047	-0,044
0,517	0,630	0,628	-0,113	-0,111
0,667	0,630	0,628	0,037	0,039
0,667	0,630	0,628	0,037	0,039
0,733	0,642	0,628	0,091	0,106
0,500	0,642	0,628	-0,142	-0,128
0,400	0,642	0,628	-0,242	-0,228
0,800	0,642	0,628	0,158	0,172
0,667	0,642	0,628	0,024	0,039
0,717	0,642	0,628	0,074	0,089
0,700	0,642	0,628	0,058	0,072
0,500	0,642	0,628	-0,142	-0,128
0,900	0,642	0,628	0,258	0,272
0,500	0,642	0,628	-0,142	-0,128
0,800	0,642	0,628	0,158	0,172

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,523809524	0,666666667	0,757142857	(0,524;0,667;0,757)

7. The organization uses projects to test and implement innovations.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
4	7	8	(4;7;8)	(0,4;0,7;0,8)	0,667
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
4	5	6	(4;5;6)	(0,4;0,5;0,6)	0,500
3	7	10	(3;7;10)	(0,3;0,7;1,0)	0,683
3	5	9	(3;5;9)	(0,3;0,5;0,9)	0,533
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
1	8	7	(1;8;7)	(0,1;0,8;0,7)	0,667
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
2	6	9	(2;6;9)	(0,2;0,6;0,9)	0,583
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,719047619	1	(0,100;0,719;1,000)	0,663	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,3	0,720	1	(0,300;0,720;1,000)	0,697
0,1	0,718181818	1	(0,100;0,718;1,000)	0,662

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,697	0,663	0,203	0,237
0,667	0,697	0,663	-0,030	0,004
0,900	0,697	0,663	0,203	0,237
0,883	0,697	0,663	0,187	0,221
0,800	0,697	0,663	0,103	0,137
0,500	0,697	0,663	-0,197	-0,163
0,683	0,697	0,663	-0,013	0,021
0,533	0,697	0,663	-0,163	-0,129
0,500	0,697	0,663	-0,197	-0,163
0,783	0,697	0,663	0,087	0,121
0,667	0,662	0,663	0,005	0,004
0,800	0,662	0,663	0,138	0,137
0,400	0,662	0,663	-0,262	-0,263
0,800	0,662	0,663	0,138	0,137
0,717	0,662	0,663	0,055	0,054
0,900	0,662	0,663	0,238	0,237
0,717	0,662	0,663	0,055	0,054
0,583	0,662	0,663	-0,079	-0,079
0,900	0,662	0,663	0,238	0,237
0,500	0,662	0,663	-0,162	-0,163
0,800	0,662	0,663	0,138	0,137

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,580952381	0,719047619	0,80952381	(0,581;0,719;0,810)

8. The selection process of projects takes its innovative potential into account.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
3	7	9	(3;7;9)	(0,3;0,7;0,9)	0,667
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	7	9	(4;7;9)	(0,4;0,7;0,9)	0,683
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
2	7	8	(2;7;8)	(0,2;0,8	0,633
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
3	5	6	(3;5;6)	(0,3;0,5;0,6)	0,483
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,647619048	1	(0,000;0,648;1,000)	0,598	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,3	0,700	0,9	(0,300;0,700;0,900)	0,667
0	0,600	1	(0,000;0,600;1,000)	0,567

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,667	0,598	0,133	0,202
0,583	0,667	0,598	-0,083	-0,015
0,700	0,667	0,598	0,033	0,102
0,800	0,667	0,598	0,133	0,202
0,800	0,667	0,598	0,133	0,202
0,783	0,667	0,598	0,117	0,185
0,667	0,667	0,598	0,000	0,068
0,517	0,667	0,598	-0,150	-0,082
0,683	0,667	0,598	0,017	0,085
0,583	0,667	0,598	-0,083	-0,015
0,633	0,567	0,598	0,067	0,035
0,700	0,567	0,598	0,133	0,102
1,000	0,567	0,598	0,433	0,402
0,600	0,567	0,598	0,033	0,002
0,483	0,567	0,598	-0,083	-0,115
0,717	0,567	0,598	0,150	0,118
0,000	0,567	0,598	-0,567	-0,598
0,500	0,567	0,598	-0,067	-0,098
0,800	0,567	0,598	0,233	0,202
0,500	0,567	0,598	-0,067	-0,098
0,600	0,567	0,598	0,033	0,002

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,528571429	0,647619048	0,723809524	(0,529;0,648;0,724)

9. Business cases are created and are the foundation for project planning

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
2	4	7	(2;4;7)	(0,2;0,4;0,7)	0,417
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
3	6	9	(3;6;9)	(0,3;0,6;0,9)	0,600
3	6	9	(3;6;9)	(0,3;0,6;0,9)	0,600
2	3	5	(2;3;5)	(0,2;0,3;0,5)	0,317
3	4	4	(3;4;4)	(0,3;0,4;0,4)	0,383
1	7	8	(1;7;8)	(0,1;0,7;0,8)	0,617
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
2	5	6	(2;5;6)	(0,2;0,5;0,6)	0,467
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
5	6	8	(5;6;8)	(0,5;0,6;0,8)	0,617
8	5	2	(8;5;2)	(0,8;0,5;0,2)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,580952381	0,9	(0,100;0,581;0,900)	0,554	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,52	0,9	(0,200;0,520;0,900)	0,530
0,1	0,636363636	0,8	(0,100;0,636;0,800)	0,574

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,400	0,530	0,554	-0,130	-0,154
0,417	0,530	0,554	-0,113	-0,137
0,500	0,530	0,554	-0,030	-0,054
0,883	0,530	0,554	0,353	0,329
0,600	0,530	0,554	0,070	0,046
0,500	0,530	0,554	-0,030	-0,054
0,600	0,530	0,554	0,070	0,046
0,600	0,530	0,554	0,070	0,046
0,317	0,530	0,554	-0,213	-0,237
0,383	0,530	0,554	-0,147	-0,171
0,617	0,574	0,554	0,042	0,063
0,800	0,574	0,554	0,226	0,246
0,500	0,574	0,554	-0,074	-0,054
0,500	0,574	0,554	-0,074	-0,054
0,467	0,574	0,554	-0,108	-0,087
0,783	0,574	0,554	0,209	0,229
0,617	0,574	0,554	0,042	0,063
0,500	0,574	0,554	-0,074	-0,054
0,800	0,574	0,554	0,226	0,246
0,500	0,574	0,554	-0,074	-0,054
0,800	0,574	0,554	0,226	0,246

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,471428571	0,580952381	0,657142857	(0,471;0,581;0,657)

10. Project planning incorporates time for innovative activities.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
4	7	9	(4;7;9)	(0,4;0,7;0,9)	0,683
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
3	6	10	(3;6;10)	(0,3;0,6;1,0)	0,617
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
4	8	8	(4;8;8)	(0,4;0,8;0,8)	0,733
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
4	5	6	(4;5;6)	(0,4;0,5;0,6)	0,500
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,585714286	1	(0,000;0,586;1,000)	0,557	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,3	0,65	1	(0,300;0,650;1,000)	0,650
0	0,527272727	0,8	(0,000;0,527;0,800)	0,485

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,700	0,650	0,557	0,050	0,143
0,683	0,650	0,557	0,033	0,126
0,800	0,650	0,557	0,150	0,243
0,700	0,650	0,557	0,050	0,143
0,700	0,650	0,557	0,050	0,143
0,583	0,650	0,557	-0,067	0,026
0,617	0,650	0,557	-0,033	0,060
0,517	0,650	0,557	-0,133	-0,040
0,700	0,650	0,557	0,050	0,143
0,500	0,650	0,557	-0,150	-0,057
0,733	0,485	0,557	0,248	0,176
0,700	0,485	0,557	0,215	0,143
0,500	0,485	0,557	0,015	-0,057
0,500	0,485	0,557	0,015	-0,057
0,500	0,485	0,557	0,015	-0,057
0,000	0,485	0,557	-0,485	-0,557
0,700	0,485	0,557	0,215	0,143
0,000	0,485	0,557	-0,485	-0,557
0,800	0,485	0,557	0,315	0,243
0,500	0,485	0,557	0,015	-0,057
0,800	0,485	0,557	0,315	0,243

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,480952381	0,585714286	0,671428571	(0,481;0,586;0,671)

11. Top management support.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
6	8	10	(6;8;10)	(0,6;0,8;1,0)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
2	5	10	(2;5;10)	(0,2;0,5;1,0)	0,533
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
4	8	8	(4;8;8)	(0,4;0,8;0,8)	0,733
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
6	8	9	(6;8;9)	(0,6;0,8;0,9)	0,783
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
8	8	9	(8;8;9)	(0,8;0,8;0,9)	0,817
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,795238095	1	(0,200;0,795;1,000)	0,730	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,75	1	(0,200;0,750;1,000)	0,700
0,4	0,836363636	1	(0,200;0,836;1,000)	0,791

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
1,000	0,700	0,730	0,300	0,270
0,800	0,700	0,730	0,100	0,070
0,500	0,700	0,730	-0,200	-0,230
1,000	0,700	0,730	0,300	0,270
0,900	0,700	0,730	0,200	0,170
0,717	0,700	0,730	0,017	-0,013
0,533	0,700	0,730	-0,167	-0,197
0,717	0,700	0,730	0,017	-0,013
0,700	0,700	0,730	0,000	-0,030
0,717	0,700	0,730	0,017	-0,013
0,733	0,791	0,730	-0,058	0,003
0,800	0,791	0,730	0,009	0,070
1,000	0,791	0,730	0,209	0,270
0,900	0,791	0,730	0,109	0,170
0,783	0,791	0,730	-0,008	0,053
0,900	0,791	0,730	0,109	0,170
0,817	0,791	0,730	0,026	0,087
1,000	0,791	0,730	0,209	0,270
0,900	0,791	0,730	0,109	0,170
0,500	0,791	0,730	-0,291	-0,230
0,800	0,791	0,730	0,009	0,070

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,714285714	0,795238095	0,880952381	(0,714;0,795;0,881)

12, The organization performs intensive scanning activities.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
2	5	6	(2;5;6)	(0,2;0,5;0,6)	0,467
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
9	9	10	(9;9;10)	(0,9;0,9;1,0)	0,917
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
2	5	10	(2;5;10)	(0,2;0,5;1,0)	0,533
5	6	9	(5;6;9)	(0,5;0,6;0,9)	0,633
4	7	9	(4;7;9)	(0,4;0,7;0,9)	0,683
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
3	7	8	(3;7;8)	(0,3;0,7;0,8)	0,650
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
5	7	8	(5;7;8)	(0,5;0,7;0,8)	0,683
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
6	7	7	(6;7;7)	(0,6;0,7;0,7)	0,683
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,695238095	1	(0,200;0,695;1,000)	0,663	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,650	1	(0,200;0,650;1,000)	0,633
0,3	0,736363636	1	(0,300;0,736;1,000)	0,708

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,700	0,633	0,663	0,067	0,037
0,467	0,633	0,663	-0,167	-0,197
0,500	0,633	0,663	-0,133	-0,163
0,917	0,633	0,663	0,283	0,253
0,800	0,633	0,663	0,167	0,137
0,717	0,633	0,663	0,083	0,053
0,533	0,633	0,663	-0,100	-0,130
0,633	0,633	0,663	0,000	-0,030
0,683	0,633	0,663	0,050	0,020
0,600	0,633	0,663	-0,033	-0,063
0,650	0,708	0,663	-0,058	-0,013
0,700	0,708	0,663	-0,008	0,037
0,500	0,708	0,663	-0,208	-0,163
0,900	0,708	0,663	0,192	0,237
0,683	0,708	0,663	-0,024	0,020
0,900	0,708	0,663	0,192	0,237
0,683	0,708	0,663	-0,024	0,020
0,800	0,708	0,663	0,092	0,137
0,900	0,708	0,663	0,192	0,237
0,500	0,708	0,663	-0,208	-0,163
0,800	0,708	0,663	0,092	0,137

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,6	0,695238095	0,780952381	(0,600;0,695;0,781)

13. The organization maintains contact with its network.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
2	4	5	(2;4;5)	(0,2;0,4;0,5)	0,383
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	9	9	(8;8;9)	(0,8;0,9;0,9)	0,883
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
2	4	5	(2;4;5)	(0,2;0,4;0,5)	0,383
2	5	10	(2;5;10)	(0,2;0,5;1,0)	0,533
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
2	8	9	(2;8;9)	(0,2;0,8;0,9)	0,717
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
3	5	6	(3;5;6)	(0,3;0,5;0,6)	0,483
9	9	10	(9;9;910)	(0,9;0,9;1,0)	0,917
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,671428571	1	(0,000;0,671;1,000)	0,614	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,640	1	(0,200;0,640;1,000)	0,627
0	0,700	1	(0,000;0,700;1,000)	0,633

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,627	0,614	0,273	0,286
0,383	0,627	0,614	-0,243	-0,231
0,800	0,627	0,614	0,173	0,186
0,883	0,627	0,614	0,257	0,269
0,700	0,627	0,614	0,073	0,086
0,383	0,627	0,614	-0,243	-0,231
0,533	0,627	0,614	-0,093	-0,081
0,517	0,627	0,614	-0,110	-0,098
0,700	0,627	0,614	0,073	0,086
0,600	0,627	0,614	-0,027	-0,014
0,717	0,633	0,614	0,083	0,102
0,700	0,633	0,614	0,067	0,086
0,000	0,633	0,614	-0,633	-0,614
0,900	0,633	0,614	0,267	0,286
0,483	0,633	0,614	-0,150	-0,131
0,917	0,633	0,614	0,283	0,302
0,783	0,633	0,614	0,150	0,169
0,800	0,633	0,614	0,167	0,186
1,000	0,633	0,614	0,367	0,386
0,500	0,633	0,614	-0,133	-0,114
0,800	0,633	0,614	0,167	0,186

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,561904762	0,671428571	0,752380952	(0,562;0,671;0,752)

14. An entrepreneurial vision.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
2	5	8	(2;5;8)	(0,2;0,5;0,8)	0,500
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
1	7	7	(1;7;7)	(0,1;0,7;0,7)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
2	3	5	(2;3;5)	(0,2;0,3;0,5)	0,317
8	9	10	(8;9;10)	(0,85;0,9;1,0)	0,900
6	7	7	(6;7;7)	(0,6;0,7;0,7)	0,683
6	4	2	(6;4;2)	(0,6;0,4;0,2)	0,400
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,604761905	1	(0,000;0,605;1,000)	0,570	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,67	0,9	(0,200;0,670;0,900)	0,630
0	0,545454545	1	(0,000;0,545;1,000)	0,530

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,700	0,630	0,570	0,070	0,130
0,583	0,630	0,570	-0,047	0,013
0,500	0,630	0,570	-0,130	-0,070
0,883	0,630	0,570	0,253	0,313
0,700	0,630	0,570	0,070	0,130
0,800	0,630	0,570	0,170	0,230
0,500	0,630	0,570	-0,130	-0,070
0,700	0,630	0,570	0,070	0,130
0,600	0,630	0,570	-0,030	0,030
0,700	0,630	0,570	0,070	0,130
0,600	0,530	0,570	0,070	0,030
0,500	0,530	0,570	-0,030	-0,070
0,500	0,530	0,570	-0,030	-0,070
0,700	0,530	0,570	0,170	0,130
0,317	0,530	0,570	-0,214	-0,253
0,900	0,530	0,570	0,370	0,330
0,683	0,530	0,570	0,153	0,113
0,400	0,530	0,570	-0,130	-0,170
0,800	0,530	0,570	0,270	0,230
0,500	0,530	0,570	-0,030	-0,070
0,000	0,530	0,570	-0,530	-0,570

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,504761905	0,604761905	0,666666667	(0,505;0,605;0,667)

15. Entrepreneurial attitude and the performance of entrepreneurial activities are part of the organizational culture

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
4	7	9	(4;7;9)	(0,4;0,7;0,9)	0,683
7	7	7	(7;7;7;)	(0,7;0,7;0,7)	0,700
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
2	6	10	(2;6;10)	(0,2;0,6;1,0)	0,600
5	6	9	(5;6;9)	(0,5;0,6;0,9)	0,633
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
2	7	8	(2;7;8)	(0,2;0,7;0,8)	0,633
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
2	4	5	(2;4;5)	(0,2;0,4;0,5)	0,383
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,70952381	1	(0,200;0,710;1,000)	0,673	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,73	1	(0,200;0,730;1,000)	0,687
0,2	0,690909091	1	(0,200;0,691;1,000)	0,661

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,687	0,673	0,213	0,227
0,683	0,687	0,673	-0,003	0,010
0,700	0,687	0,673	0,013	0,027
0,883	0,687	0,673	0,197	0,210
0,900	0,687	0,673	0,213	0,227
0,700	0,687	0,673	0,013	0,027
0,600	0,687	0,673	-0,087	-0,073
0,633	0,687	0,673	-0,053	-0,040
0,583	0,687	0,673	-0,103	-0,090
0,700	0,687	0,673	0,013	0,027
0,633	0,661	0,673	-0,027	-0,040
0,600	0,661	0,673	-0,061	-0,073
0,500	0,661	0,673	-0,161	-0,173
0,700	0,661	0,673	0,039	0,027
0,383	0,661	0,673	-0,277	-0,290
0,800	0,661	0,673	0,139	0,127
0,800	0,661	0,673	0,139	0,127
1,000	0,661	0,673	0,339	0,327
0,800	0,661	0,673	0,139	0,127
0,500	0,661	0,673	-0,161	-0,173
0,800	0,661	0,673	0,139	0,127

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,604761905	0,70952381	0,785714286	(0,605;0,710;0,786)

16. Employees are attracted to entrepreneurial activities.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
1	5	9	(1;5;9)	(0,1;0,5;0,9)	0,500
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
3	8	9	(3;8;9)	(0,3;0,5;0,9)	0,733
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
2	3	5	(2;3;5)	(0,2;0,3;0,5)	0,317
6	8	9	(6;8;9)	(0,6;0,8;0,9)	0,783
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
9	8	7	(9;8;7)	(0,9;0,8;0,7)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,704761905	0,9	(0,100;0,705;0,900)	0,637	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,7	0,9	(0,100;0,700;0,900)	0,633
0,2	0,709090909	0,9	(0,200;0,709;0,900)	0,656

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,633	0,637	0,167	0,163
0,583	0,633	0,637	-0,050	-0,053
0,700	0,633	0,637	0,067	0,063
0,883	0,633	0,637	0,250	0,247
0,800	0,633	0,637	0,167	0,163
0,700	0,633	0,637	0,067	0,063
0,500	0,633	0,637	-0,133	-0,137
0,700	0,633	0,637	0,067	0,063
0,700	0,633	0,637	0,067	0,063
0,600	0,633	0,637	-0,033	-0,037
0,733	0,656	0,637	0,077	0,097
0,700	0,656	0,637	0,044	0,063
0,600	0,656	0,637	-0,056	-0,037
0,800	0,656	0,637	0,144	0,163
0,317	0,656	0,637	-0,339	-0,320
0,783	0,656	0,637	0,127	0,147
0,800	0,656	0,637	0,144	0,163
0,800	0,656	0,637	0,144	0,163
0,900	0,656	0,637	0,244	0,263
0,500	0,656	0,637	-0,156	-0,137
0,800	0,656	0,637	0,144	0,163

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,60952381	0,704761905	0,771428571	(0,610;0,705;0,771)

17. The organization stimulates and encourages its members to act entrepreneurial.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
6	8	9	(6;8;9)	(0,6;0,8;0,9)	0,783
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
1	5	8	(1;5;8)	(0,1;0,5;0,8)	0,483
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
4	8	8	(4;8;8)	(0,4;0,8;0,8)	0,733
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
2	3	4	(2;3;4)	(0,2;0,3;0,4)	0,300
6	8	9	(6;8;9)	(0,6;0,8;0,9)	0,783
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
9	8	7	(9;8;7)	(0,9;0,8;0,7)	0,800
10	10	10	(10;10;10)	(0,1;0,1;0,1)	1,000
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,695238095	1	(0,100;0,695;1,000)	0,647	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,67	0,9	(0,100;0,670;0,900)	0,613
0,2	0,718181818	1	(0,200;0,718;1,000)	0,679

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,300	0,613	0,647	-0,313	-0,347
0,783	0,613	0,647	0,170	0,137
0,600	0,613	0,647	-0,013	-0,047
0,883	0,613	0,647	0,270	0,237
0,800	0,613	0,647	0,187	0,153
0,783	0,613	0,647	0,170	0,137
0,483	0,613	0,647	-0,130	-0,163
0,700	0,613	0,647	0,087	0,053
0,583	0,613	0,647	-0,030	-0,063
0,700	0,613	0,647	0,087	0,053
0,733	0,679	0,647	0,055	0,087
0,800	0,679	0,647	0,121	0,153
0,600	0,679	0,647	-0,079	-0,047
0,800	0,679	0,647	0,121	0,153
0,300	0,679	0,647	-0,379	-0,347
0,783	0,679	0,647	0,105	0,137
0,717	0,679	0,647	0,038	0,070
0,800	0,679	0,647	0,121	0,153
1,000	0,679	0,647	0,321	0,353
0,500	0,679	0,647	-0,179	-0,147
0,800	0,679	0,647	0,121	0,153

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,60952381	0,695238095	0,738095238	(0,610;0,695;0,738)

18. The organization offers recourses to members to employ entrepreneurial activities

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
6	7	6	(6;7;6)	(0,6;0,7;0,6)	0,667
2	6	10	(2;6;10)	(0,2;0,6;1,0)	0,600
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
4	8	9	(4;8;9)	(0,4;0,8;0,9)	0,750
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
2	3	4	(2;3;4)	(0,2;0,3;0,4)	0,300
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	9	(8;8;9)	(0,8;0,8;0,9)	0,817
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,728571429	1	(0,200;0,729;1,000)	0,686	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,74	1	(0,200;0,740;1,000)	0,693
0,2	0,718181818	1	(0,200;0,718;1,000))	0,679

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,693	0,686	0,107	0,114
0,517	0,693	0,686	-0,177	-0,169
1,000	0,693	0,686	0,307	0,314
1,000	0,693	0,686	0,307	0,314
0,900	0,693	0,686	0,207	0,214
0,667	0,693	0,686	-0,027	-0,019
0,600	0,693	0,686	-0,093	-0,086
0,700	0,693	0,686	0,007	0,014
0,500	0,693	0,686	-0,193	-0,186
0,700	0,693	0,686	0,007	0,014
0,750	0,679	0,686	0,071	0,064
0,700	0,679	0,686	0,021	0,014
0,600	0,679	0,686	-0,079	-0,086
0,800	0,679	0,686	0,121	0,114
0,300	0,679	0,686	-0,379	-0,386
0,800	0,679	0,686	0,121	0,114
0,817	0,679	0,686	0,138	0,131
1,000	0,679	0,686	0,321	0,314
0,900	0,679	0,686	0,221	0,214
0,500	0,679	0,686	-0,179	-0,186
0,700	0,679	0,686	0,021	0,014

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,647619048	0,728571429	0,795238095	(0,648;0,729;0,795)

19. Experts offer relevant knowledge to organizational members.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
5	5	5	(5;5;5;)	(0,5;0,5;0,5)	0,500
1	3	4	(1;3;4)	(0,1;0,3;0,4)	0,283
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	8	7	(7;8;7)	(0,7;0,8;0,7)	0,767
1	4	8	(1;4;8)	(0,1;0,4;0,8)	0,417
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
2	8	8	(2;8;8)	(0,2;0,8;0,8)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
8	8	9	(8;8;9)	(0,8;0,8;0,9)	0,817
8	7	6	(8;7;6)	(0,8;0,7;0,6)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(4;5;5)	(0,5;0,5;0,5)	0,500
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,642857143	0,9	(0,100;0,643;0,900)	0,595	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,61	0,9	(0,100;0,610;0,900)	0,573
0,2	0,672727273	0,9	(0,200;0,673)	0,632

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,500	0,573	0,595	-0,073	-0,095
0,283	0,573	0,595	-0,290	-0,312
0,800	0,573	0,595	0,227	0,205
0,900	0,573	0,595	0,327	0,305
0,900	0,573	0,595	0,327	0,305
0,767	0,573	0,595	0,193	0,171
0,417	0,573	0,595	-0,157	-0,179
0,517	0,573	0,595	-0,057	-0,079
0,600	0,573	0,595	0,027	0,005
0,400	0,573	0,595	-0,173	-0,195
0,700	0,632	0,595	0,068	0,105
0,600	0,632	0,595	-0,032	0,005
0,500	0,632	0,595	-0,132	-0,095
0,800	0,632	0,595	0,168	0,205
0,500	0,632	0,595	-0,132	-0,095
0,600	0,632	0,595	-0,032	0,005
0,817	0,632	0,595	0,185	0,221
0,700	0,632	0,595	0,068	0,105
0,900	0,632	0,595	0,268	0,305
0,500	0,632	0,595	-0,132	-0,095
0,700	0,632	0,595	0,068	0,105

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,547619048	0,642857143	0,70952381	(0,548;0,643;0,710)

20. Members are stimulated to take risks.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
2	6	8	(2;6;10)	(0,2;0,6;0,8)	0,567
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
3	5	6	(3;5;6)	(0,3;0,5;0,6)	0,483
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
4	8	7	(4;8;7)	(0,4;0,8;0,7)	0,717
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
3	5	5	(3;5;5)	(0,3;0,5;0,5)	0,467
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
5	6	6	(5;6;6)	(0,5;0,5;0,6)	0,583
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,595238095	0,9	(0,200;0,595;0,900)	0,580	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,6	0,9	(0,200;0,600;0,900)	0,583
0,3	0,590909091	0,8	(0,300;0,590;0,800)	0,577

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,700	0,583	0,580	0,117	0,120
0,400	0,583	0,580	-0,183	-0,180
0,500	0,583	0,580	-0,083	-0,080
0,900	0,583	0,580	0,317	0,320
0,600	0,583	0,580	0,017	0,020
0,700	0,583	0,580	0,117	0,120
0,567	0,583	0,580	-0,017	-0,013
0,517	0,583	0,580	-0,067	-0,063
0,483	0,583	0,580	-0,100	-0,097
0,600	0,583	0,580	0,017	0,020
0,717	0,577	0,580	0,139	0,137
0,500	0,577	0,580	-0,077	-0,080
0,500	0,577	0,580	-0,077	-0,080
0,600	0,577	0,580	0,023	0,020
0,467	0,577	0,580	-0,111	-0,113
0,400	0,577	0,580	-0,177	-0,180
0,583	0,577	0,580	0,006	0,003
0,600	0,577	0,580	0,023	0,020
0,800	0,577	0,580	0,223	0,220
0,500	0,577	0,580	-0,077	-0,080
0,700	0,577	0,580	0,123	0,120

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,495238095	0,595238095	0,647619048	(0,495;0,595;0,648)

21. The reward system takes into account the innovativeness and entrepreneurial activities of an employee.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	6	7	(7;6;7)	(0,7;0,6;0,7)	0,633
1	4	6	(1;4;6)	(0,1;0,4;0,6)	0,383
2	5	10	(2;5;10)	(0,2;0,5;1,0)	0,533
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
3	8	9	(3;8;9)	(0,3;0,8;0,9)	0,733
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
2	3	4	(2;3;4)	(0,2;0,3;0,4)	0,300
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,642857143	1	(0,100;0,643;1,000)	0,612	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,64	1	(0,100;0,640;1,000)	0,610
0,2	0,645454545	0,9	(0,200;0,645;0,900)	0,614

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,610	0,612	0,190	0,188
0,583	0,610	0,612	-0,027	-0,029
0,800	0,610	0,612	0,190	0,188
0,900	0,610	0,612	0,290	0,288
0,633	0,610	0,612	0,023	0,021
0,383	0,610	0,612	-0,227	-0,229
0,533	0,610	0,612	-0,077	-0,079
0,517	0,610	0,612	-0,093	-0,095
0,583	0,610	0,612	-0,027	-0,029
0,700	0,610	0,612	0,090	0,088
0,733	0,614	0,612	0,120	0,121
0,600	0,614	0,612	-0,014	-0,012
0,600	0,614	0,612	-0,014	-0,012
0,700	0,614	0,612	0,086	0,088
0,300	0,614	0,612	-0,314	-0,312
0,717	0,614	0,612	0,103	0,105
0,717	0,614	0,612	0,103	0,105
0,700	0,614	0,612	0,086	0,088
0,700	0,614	0,612	0,086	0,088
0,500	0,614	0,612	-0,114	-0,112
0,800	0,614	0,612	0,186	0,188

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,538095238	0,642857143	0,747619048	(0,538;0,643;0,748)

22. The client creates space for innovation in a project

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
0	2	3	(0;2;3)	(0,0;0,2;0,3)	0,183
2	4	7	(2;4;7)	(0,2;0,4;0,7)	0,417
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
1	7	7	(1;7;7)	(0,1;0,7;0,7)	0,600
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
4	4	6	(4;4;6)	(0,4;0,4;0,6)	0,433
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
10	10	10	(10;10;10)	(0,1;0,1;0,1)	1,000
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,657142857	1	(0,000;0,657;1,000)	0,605	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,68	1	(0,000;0,680;1,000)	0,620
0	0,636363636	1	(0,000;0,636;1,000)	0,591

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,620	0,605	0,280	0,295
0,700	0,620	0,605	0,080	0,095
1,000	0,620	0,605	0,380	0,395
1,000	0,620	0,605	0,380	0,395
0,700	0,620	0,605	0,080	0,095
0,183	0,620	0,605	-0,437	-0,421
0,417	0,620	0,605	-0,203	-0,188
0,517	0,620	0,605	-0,103	-0,088
0,700	0,620	0,605	0,080	0,095
0,700	0,620	0,605	0,080	0,095
0,600	0,591	0,605	0,009	-0,005
0,400	0,591	0,605	-0,191	-0,205
1,000	0,591	0,605	0,409	0,395
0,600	0,591	0,605	0,009	-0,005
0,700	0,591	0,605	0,109	0,095
0,433	0,591	0,605	-0,158	-0,171
0,800	0,591	0,605	0,209	0,195
0,000	0,591	0,605	-0,591	-0,605
0,800	0,591	0,605	0,209	0,195
1,000	0,591	0,605	0,409	0,395
0,600	0,591	0,605	0,009	-0,005

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,557142857	0,657142857	0,742857143	(0,557;0,657;0,743)

23. Research and Development activities.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
2	2	2	(2;2;2)	(0,2;0,2;0,2)	0,200
1	2	4	(1;2;4)	(0,1;0,2;0,4)	0,217
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	9	10	(7;9;10)	(0,7;0,9;1,0)	0,883
2	4	7	(2;4;7)	(0,2;0,4;0,7)	0,417
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,623809524	1	(0,100; 0,624;1,000)	0,599	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,56	1	(0,100;0,560;1,000)	0,557
0,3	0,681818182	0,9	(0,300;0,682;0,900)	0,655

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,200	0,557	0,599	-0,357	-0,399
0,217	0,557	0,599	-0,340	-0,383
0,600	0,557	0,599	0,043	0,001
0,900	0,557	0,599	0,343	0,301
0,700	0,557	0,599	0,143	0,101
0,883	0,557	0,599	0,327	0,284
0,417	0,557	0,599	-0,140	-0,183
0,517	0,557	0,599	-0,040	-0,083
0,400	0,557	0,599	-0,157	-0,199
0,800	0,557	0,599	0,243	0,201
0,583	0,655	0,599	-0,071	-0,016
0,600	0,655	0,599	-0,055	0,001
0,500	0,655	0,599	-0,155	-0,099
0,800	0,655	0,599	0,145	0,201
0,583	0,655	0,599	-0,071	-0,016
0,800	0,655	0,599	0,145	0,201
0,800	0,655	0,599	0,145	0,201
0,700	0,655	0,599	0,045	0,101
0,900	0,655	0,599	0,245	0,301
0,500	0,655	0,599	-0,155	-0,099
0,700	0,655	0,599	0,045	0,101

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,542857143	0,623809524	0,704761905	(0,543;0,624;0,705)

24. Promotion and enabling of integration in the value chain.

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
1	3	5	(1;3;5)	(0,1;0,3;0,5)	0,300
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
1	3	6	(1;3;6)	(0,1;0,3;0,6)	0,317
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
3	8	9	(3;8;9)	(0,3;0,8;0,9)	0,733
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
2	3	5	(2;3;5)	(0,2;0,3;0,5)	0,317
7	9	10	(7;9;10)	(0,7;0,9;1,0)	0,883
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,585714286	1	(0,100;0,586;1,000)	0,574	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,51	0,9	(0,100;0,510;0,900)	0,507
0,2	0,654545455	1	(0,200;0,655;1,000)	0,636

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,300	0,507	0,574	-0,207	-0,274
0,300	0,507	0,574	-0,207	-0,274
0,400	0,507	0,574	-0,107	-0,174
0,900	0,507	0,574	0,393	0,326
0,700	0,507	0,574	0,193	0,126
0,400	0,507	0,574	-0,107	-0,174
0,317	0,507	0,574	-0,190	-0,257
0,517	0,507	0,574	0,010	-0,057
0,700	0,507	0,574	0,193	0,126
0,600	0,507	0,574	0,093	0,026
0,733	0,636	0,574	0,097	0,160
0,717	0,636	0,574	0,080	0,143
0,400	0,636	0,574	-0,236	-0,174
0,600	0,636	0,574	-0,036	0,026
0,317	0,636	0,574	-0,320	-0,257
0,883	0,636	0,574	0,247	0,310
0,783	0,636	0,574	0,147	0,210
0,500	0,636	0,574	-0,136	-0,074
0,900	0,636	0,574	0,264	0,326
0,500	0,636	0,574	-0,136	-0,074
0,800	0,636	0,574	0,164	0,226

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,49047619	0,585714286	0,671428571	(0,490;0,586;0,671)

25. Draw attention to inspiring examples

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
2	5	7	(2;5;7)	(0,2;0,5;0,7)	0,483
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
1	5	10	(1;5;10)	(0,1;0,5;1,0)	0,517
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
4	5	7	(4;5;7)	(0,4;0,5;0,7)	0,517
3	7	8	(3;7;8)	(0,3;0,7;0,8)	0,650
7	6	7	(7;6;7)	(0,7;0,6;0,7)	0,633
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
6	7	9	(6;7;9)	(0,6;0,7;0,9)	0,717
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
7	8	10	(7;8;10)	(0,7;0,8;1,0)	0,817
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,642857143	1	(0,100;0,643;1,000)	0,612	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,570	1	(0,100;0,570;1,000)	0,563
0,3	0,709090909	1	(0,300;0,709;1,000)	0,689

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,400	0,563	0,612	-0,163	-0,212
0,483	0,563	0,612	-0,080	-0,129
0,400	0,563	0,612	-0,163	-0,212
0,800	0,563	0,612	0,237	0,188
0,800	0,563	0,612	0,237	0,188
0,700	0,563	0,612	0,137	0,088
0,517	0,563	0,612	-0,047	-0,095
0,517	0,563	0,612	-0,047	-0,095
0,600	0,563	0,612	0,037	-0,012
0,517	0,563	0,612	-0,047	-0,095
0,650	0,689	0,612	-0,039	0,038
0,633	0,689	0,612	-0,056	0,021
0,500	0,689	0,612	-0,189	-0,112
0,800	0,689	0,612	0,111	0,188
0,717	0,689	0,612	0,027	0,105
0,700	0,689	0,612	0,011	0,088
0,817	0,689	0,612	0,127	0,205
0,800	0,689	0,612	0,111	0,188
0,900	0,689	0,612	0,211	0,288
0,500	0,689	0,612	-0,189	-0,112
0,800	0,689	0,612	0,111	0,188

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,538095238	0,642857143	0,761904762	(0,538;0,643;0,762)

26. Constant education of new and experienced employees (reflective practitioner

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
3	5	6	(3;5;6)	(0,3;0,5;0,6)	0,483
3	6	10	(3;6;10)	(0,3;0,6;1,0)	0,617
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
2	7	8	(2;7;8)	(0,2;0,7;0,8)	0,633
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
8	8	9	(8;8;9)	(0,8;0,8;0,9)	0,817
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
2	3	4	(2;3;4)	(0,2;0,3;0,4)	0,300
6	6	8	(6;6;8)	(0,6;0,6;0,8)	0,633
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,657142857	1	(0,200;0,657;1,000)	0,638	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,3	0,63	1	(0,300;0,630;1,000)	0,637
0,2	0,681818182	0,9	(0,200;0,682;0,900)	0,638

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,600	0,637	0,638	-0,037	-0,038
0,583	0,637	0,638	-0,053	-0,055
0,500	0,637	0,638	-0,137	-0,138
0,883	0,637	0,638	0,247	0,245
0,800	0,637	0,638	0,163	0,162
0,483	0,637	0,638	-0,153	-0,155
0,617	0,637	0,638	-0,020	-0,021
0,517	0,637	0,638	-0,120	-0,121
0,600	0,637	0,638	-0,037	-0,038
0,700	0,637	0,638	0,063	0,062
0,633	0,638	0,638	-0,005	-0,005
0,700	0,638	0,638	0,062	0,062
0,817	0,638	0,638	0,179	0,179
0,800	0,638	0,638	0,162	0,162
0,300	0,638	0,638	-0,338	-0,338
0,633	0,638	0,638	-0,005	-0,005
0,800	0,638	0,638	0,162	0,162
0,800	0,638	0,638	0,162	0,162
0,800	0,638	0,638	0,162	0,162
0,500	0,638	0,638	-0,138	-0,138
0,700	0,638	0,638	0,062	0,062

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,552380952	0,657142857	0,752380952	(0,552;0,657;0,752)

27. Stimulate contact between generation; new, experienced, young, old employees

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
1	3	5	(1;3;5)	(0,1;0,3;0,5)	0,300
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
2	5	10	(2;5;10)	(0,2;0,5;1,0)	0,533
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
5	6	6	(5;6;6)	(0,5;0,6;0,6)	0,583
3	8	8	(3;8;8)	(0,3;0,8;0,8)	0,717
8	8	7	(8;8;7)	(0,8;0,8;0,7)	0,783
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
2	3	5	(2;3;5)	(0,2;0,3;0,5)	0,317
8	8	9	(8;8;9)	(0,8;0,8;0,9)	0,817
6	7	7	(6;7;7)	(0,6;0,7;0,7)	0,683
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,695238095	1	(0,100;0,695;1,000)	0,647	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,64	1	(0,100;0,640;1,000)	0,610
0,2	0,745454545	1	(0,200;0,745;1,000)	0,697

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,610	0,647	0,190	0,153
0,300	0,610	0,647	-0,310	-0,347
0,700	0,610	0,647	0,090	0,053
0,800	0,610	0,647	0,190	0,153
0,900	0,610	0,647	0,290	0,253
0,583	0,610	0,647	-0,027	-0,063
0,533	0,610	0,647	-0,077	-0,113
0,517	0,610	0,647	-0,093	-0,130
0,700	0,610	0,647	0,090	0,053
0,583	0,610	0,647	-0,027	-0,063
0,717	0,697	0,647	0,020	0,070
0,783	0,697	0,647	0,086	0,137
0,700	0,697	0,647	0,003	0,053
0,800	0,697	0,647	0,103	0,153
0,317	0,697	0,647	-0,380	-0,330
0,817	0,697	0,647	0,120	0,170
0,683	0,697	0,647	-0,014	0,037
1,000	0,697	0,647	0,303	0,353
0,900	0,697	0,647	0,203	0,253
0,500	0,697	0,647	-0,197	-0,147
0,900	0,697	0,647	0,203	0,253

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,595238095	0,695238095	0,776190476	(0,595;0,695;0,776)

28. Making innovation measurable

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
3	6	8	(3;6;8)	(0,3;0,6;0,8)	0,583
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
1	4	6	(1;4;6)	(0,1;0,4;0,6)	0,383
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
4	5	6	(4;5;6)	(0,4;0,5;0,6)	0,500
4	9	9	(4;9;9)	(0,4;0,9;0,9)	0,817
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
1	2	3	(1;2;3)	(0,1;0,2;0,3)	0,200
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	5	4	(6;5;4)	(0,6;0,;0,4)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,652380952	0,9	(0,100;0,652;0,900)	0,602	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,1	0,65	0,9	(0,100;0,650;0,900)	0,600
0,1	0,654545455	0,9	(0,100;0,655;0,900)	0,603

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,600	0,602	0,300	0,298
0,583	0,600	0,602	-0,017	-0,018
0,900	0,600	0,602	0,300	0,298
0,900	0,600	0,602	0,300	0,298
0,800	0,600	0,602	0,200	0,198
0,383	0,600	0,602	-0,217	-0,218
0,400	0,600	0,602	-0,200	-0,202
0,700	0,600	0,602	0,100	0,098
0,400	0,600	0,602	-0,200	-0,202
0,500	0,600	0,602	-0,100	-0,102
0,817	0,603	0,602	0,214	0,215
0,900	0,603	0,602	0,297	0,298
0,700	0,603	0,602	0,097	0,098
0,600	0,603	0,602	-0,003	-0,002
0,200	0,603	0,602	-0,403	-0,402
0,800	0,603	0,602	0,197	0,198
0,700	0,603	0,602	0,097	0,098
0,500	0,603	0,602	-0,103	-0,102
0,900	0,603	0,602	0,297	0,298
0,500	0,603	0,602	-0,103	-0,102
0,500	0,603	0,602	-0,103	-0,102

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,561904762	0,652380952	0,70952381	(0,562;0,652;0,710)

29. The fragmented nature of the building process

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	9	9	(8;8;9)	(0,8;0,9;0,9)	0,883
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
6	5	4	(6;5;4)	(0,6;0,5;0,4)	0,500
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	5	6	(4;5;6)	(0,4;0,5;0,6)	0,500
4	6	6	(4;6;6)	(0,4;0,6;0,6)	0,567
5	4	4	(5;4;4)	(0,5;0,4;0,4)	0,417
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,595238095	1	(0,000;0,595;1,000)	0,563	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,3	0,62	1	(0,300;0,620;1,000)	0,630
0	0,572727273	0,9	(0,000;0,573;0,900)	0,532

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
1,000	0,630	0,563	0,370	0,437
0,700	0,630	0,563	0,070	0,137
0,500	0,630	0,563	-0,130	-0,063
0,883	0,630	0,563	0,253	0,320
0,300	0,630	0,563	-0,330	-0,263
0,700	0,630	0,563	0,070	0,137
0,500	0,630	0,563	-0,130	-0,063
0,517	0,630	0,563	-0,113	-0,047
0,500	0,630	0,563	-0,130	-0,063
0,567	0,630	0,563	-0,063	0,003
0,417	0,532	0,563	-0,115	-0,147
0,800	0,532	0,563	0,268	0,237
0,500	0,532	0,563	-0,032	-0,063
0,600	0,532	0,563	0,068	0,037
0,500	0,532	0,563	-0,032	-0,063
0,000	0,532	0,563	-0,532	-0,563
0,500	0,532	0,563	-0,032	-0,063
0,900	0,532	0,563	0,368	0,337
0,800	0,532	0,563	0,268	0,237
0,500	0,532	0,563	-0,032	-0,063
0,800	0,532	0,563	0,268	0,237

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,542857143	0,595238095	0,642857143	(0,543;0,595;0,643)

30. The market structure

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
2	5	6	(2;5;6)	(0,2;0,5;0,6)	0,467
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
10	8	6	(10;8;6)	(1,0;0,8;0,6)	0,800
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
4	5	6	(4;5;6)	(0,4;0,5;0,6)	0,500
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
9	4	4	(9;4;4)	(0,9;0,4;0,4)	0,483
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,571428571	0,9	(0,000;0,571;0,900)	0,531	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,6	0,9	(0,200;0,600;0,900)	0,583
0	0,545454545	0,9	(0,000;0,545;0,900)	0,514

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,400	0,583	0,531	-0,183	-0,131
0,467	0,583	0,531	-0,117	-0,064
0,700	0,583	0,531	0,117	0,169
0,800	0,583	0,531	0,217	0,269
0,300	0,583	0,531	-0,283	-0,231
0,883	0,583	0,531	0,300	0,352
0,800	0,583	0,531	0,217	0,269
0,517	0,583	0,531	-0,067	-0,014
0,500	0,583	0,531	-0,083	-0,031
0,600	0,583	0,531	0,017	0,069
0,483	0,514	0,531	-0,030	-0,048
0,600	0,514	0,531	0,086	0,069
0,500	0,514	0,531	-0,014	-0,031
0,600	0,514	0,531	0,086	0,069
0,600	0,514	0,531	0,086	0,069
0,000	0,514	0,531	-0,514	-0,531
0,700	0,514	0,531	0,186	0,169
0,900	0,514	0,531	0,386	0,369
0,800	0,514	0,531	0,286	0,269
0,000	0,514	0,531	-0,514	-0,531
0,900	0,514	0,531	0,386	0,369

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,542857143	0,571428571	0,614285714	(0,543;0,571;0,614)

31. The dominant role of the client

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
6	8	9	(6;8;9)	(0,6;0,8;0,9)	0,783
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
2	2	2	(2;2;2)	(0,2;0,2;0,2)	0,200
9	9	10	(9;9;10)	(0,9;0,9;1,0)	0,917
7	4	1	(7;4;1)	(0,7;0,4;0,1)	0,400
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
5	6	6	(5;6;6)	(0,5;0,6;0,6)	0,583
5	4	4	(5;4;4)	(0,5;0,4;0,4)	0,417
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
1	2	3	(1;2;3)	(0,1;0,2;0,3)	0,200
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
2	5	9	(2;5;9)	(0,2;0,5;0,9)	0,517
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,561904762	1	(0,000;0,562;1,000)	0,541	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,62	1	(0,200;0,620;1,000)	0,613
0	0,509090909	0,9	(0,000;0,509;0,900)	0,489

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,900	0,613	0,541	0,287	0,359
0,783	0,613	0,541	0,170	0,242
0,300	0,613	0,541	-0,313	-0,241
0,900	0,613	0,541	0,287	0,359
0,200	0,613	0,541	-0,413	-0,341
0,917	0,613	0,541	0,303	0,375
0,400	0,613	0,541	-0,213	-0,141
0,600	0,613	0,541	-0,013	0,059
0,600	0,613	0,541	-0,013	0,059
0,583	0,613	0,541	-0,030	0,042
0,417	0,489	0,541	-0,073	-0,125
0,500	0,489	0,541	0,011	-0,041
0,500	0,489	0,541	0,011	-0,041
0,500	0,489	0,541	0,011	-0,041
0,200	0,489	0,541	-0,289	-0,341
0,700	0,489	0,541	0,211	0,159
0,600	0,489	0,541	0,111	0,059
0,517	0,489	0,541	0,027	-0,025
0,900	0,489	0,541	0,411	0,359
0,000	0,489	0,541	-0,489	-0,541
0,800	0,489	0,541	0,311	0,259

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,514285714	0,561904762	0,614285714	(0,514;0,562;0,614)

32. Not enough coordination between practice and research

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
1	2	3	(1;2;3)	(0,1;0,2;0,3)	0,200
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
10	6	3	(10;6;3)	(1,0;0,6;0,3)	0,617
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
5	6	7	(5;6;7)	(0,5;0,6;0,7)	0,600
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
5	4	3	(5;4;3)	(0,5;0,4;0,3)	0,400
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
0	2	3	(0;2;3)	(0,0;0,2;0,3)	0,183
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,485714286	1	(0,000;0,486;1,000)	0,490	**Reject**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,46	1	(0,000;0,460;1,000)	0,473
0	0,509090909	0,9	(0,000;0,509;0,900)	0,489

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,300	0,473	0,490	-0,173	-0,190
0,200	0,473	0,490	-0,273	-0,290
0,000	0,473	0,490	-0,473	-0,490
0,700	0,473	0,490	0,227	0,210
0,400	0,473	0,490	-0,073	-0,090
0,900	0,473	0,490	0,427	0,410
0,617	0,473	0,490	0,143	0,126
0,517	0,473	0,490	0,043	0,026
0,600	0,473	0,490	0,127	0,110
0,400	0,473	0,490	-0,073	-0,090
0,400	0,489	0,490	-0,089	-0,090
0,900	0,489	0,490	0,411	0,410
0,500	0,489	0,490	0,011	0,010
0,600	0,489	0,490	0,111	0,110
0,183	0,489	0,490	-0,306	-0,307
0,400	0,489	0,490	-0,089	-0,090
0,500	0,489	0,490	0,011	0,010
0,500	0,489	0,490	0,011	0,010
0,800	0,489	0,490	0,311	0,310
0,000	0,489	0,490	-0,489	-0,490
0,800	0,489	0,490	0,311	0,310

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,452380952	0,485714286	0,523809524	(0,452;0,486;0,524)

33. Dependency on general economic conditions

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
0	0	0	(0;0;0)	(0,0;0,;0,0)	0,000
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
5	7	8	(5;7;8)	(0,5;0,7;0,8)	0,683
8	6	2	(8;6;2)	(0,8;0,6;0,2)	0,567
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
2	3	4	(2;3;4)	(0,2;0,3;0,4)	0,300
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
3	2	1	(3;2;1)	(0,;0,2;0,1)	0,200
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
0	3	6	(0;3;6)	(0,0;0,3;0,6)	0,300
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,4	0,9	(0,000;0,400;0,900)	0,417	**Reject**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,44	0,9	(0,000;0,440;0,900)	0,443
0	0,363636364	0,8	(0,000;0,364;0,800)	0,376

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,000	0,443	0,417	-0,443	-0,417
0,600	0,443	0,417	0,157	0,183
0,000	0,443	0,417	-0,443	-0,417
0,500	0,443	0,417	0,057	0,083
0,400	0,443	0,417	-0,043	-0,017
0,683	0,443	0,417	0,240	0,267
0,567	0,443	0,417	0,123	0,150
0,500	0,443	0,417	0,057	0,083
0,300	0,443	0,417	-0,143	-0,117
0,800	0,443	0,417	0,357	0,383
0,200	0,376	0,417	-0,176	-0,217
0,600	0,376	0,417	0,224	0,183
0,500	0,376	0,417	0,124	0,083
0,300	0,376	0,417	-0,076	-0,117
0,000	0,376	0,417	-0,376	-0,417
0,000	0,376	0,417	-0,376	-0,417
0,783	0,376	0,417	0,408	0,367
0,000	0,376	0,417	-0,376	-0,417
0,800	0,376	0,417	0,424	0,383
0,000	0,376	0,417	-0,376	-0,417
0,800	0,376	0,417	0,424	0,383

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,357142857	0,4	0,423809524	(0,357;0,400;0,424)

34. The costs of research

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
3	5	6	(3;5;6)	(0,3;0,5;0,6)	0,483
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
8	5	3	(8;5;3)	(0,8;0,5;0,3)	0,517
3	5	8	(3;5;8)	(0,3;0,5;0,8)	0,517
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
6	6	7	(6;6;7)	(0,6;0,6;0,7)	0,617
7	5	3	(7;5;3)	(0,7;0,5;0,3)	0,500
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
1	2	4	(1;2;4)	(0,1;0,2;0,4)	0,217
2	5	8	(2;5;8)	(0,2;0,5;0,8)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,50952381	0,8	(0,000;0,510;0,800)	0,473	**Reject**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,61	0,8	(0,200;0,610;0,800)	0,573
0	0,418181818	0,8	(0,000;0,418;0,800)	0,412

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,500	0,573	0,473	-0,073	0,027
0,483	0,573	0,473	-0,090	0,010
0,800	0,573	0,473	0,227	0,327
0,800	0,573	0,473	0,227	0,327
0,800	0,573	0,473	0,227	0,327
0,700	0,573	0,473	0,127	0,227
0,517	0,573	0,473	-0,057	0,044
0,517	0,573	0,473	-0,057	0,044
0,400	0,573	0,473	-0,173	-0,073
0,617	0,573	0,473	0,043	0,144
0,500	0,412	0,473	0,088	0,027
0,300	0,412	0,473	-0,112	-0,173
0,500	0,412	0,473	0,088	0,027
0,600	0,412	0,473	0,188	0,127
0,217	0,412	0,473	-0,195	-0,256
0,500	0,412	0,473	0,088	0,027
0,800	0,412	0,473	0,388	0,327
0,000	0,412	0,473	-0,412	-0,473
0,800	0,412	0,473	0,388	0,327
0,000	0,412	0,473	-0,412	-0,473
0,400	0,412	0,473	-0,012	-0,073

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,471428571	0,50952381	0,561904762	(0,471;0,510;0,562)

35. Restrictions by laws and regulations

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
6	8	10	(6;8;10)	(0,6;0,8;1,0)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
9	10	10	(9;10;10)	(0,9;1,0;1,0)	0,983
6	2	0	(6;2;0)	(0,6;0,2;0,0)	0,233
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
6	7	8	(6;7;8)	(0,6;0,7;0,8)	0,700
6	7	7	(6;7;7)	(0,6;0,7;0,7)	0,683
4	2	1	(4;2;1)	(0,4;0,2;0,1)	0,217
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
1	3	3	(1;3;3)	(0,1;0,3;0,3)	0,267
8	9	10	(8;9;10)	(0,8;0,9;1,0)	0,900
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,547619048	1	(0,000;0,548;1,000)	0,532	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,59	1	(0,000;0,590;1,000)	0,560
0	0,509090909	1	(0,000;0,509;1,000)	0,506

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,000	0,560	0,532	-0,560	-0,532
0,800	0,560	0,532	0,240	0,268
0,700	0,560	0,532	0,140	0,168
0,600	0,560	0,532	0,040	0,068
0,700	0,560	0,532	0,140	0,168
0,983	0,560	0,532	0,423	0,452
0,233	0,560	0,532	-0,327	-0,298
0,500	0,560	0,532	-0,060	-0,032
0,700	0,560	0,532	0,140	0,168
0,683	0,560	0,532	0,123	0,152
0,217	0,506	0,532	-0,289	-0,315
0,500	0,506	0,532	-0,006	-0,032
0,300	0,506	0,532	-0,206	-0,232
0,600	0,506	0,532	0,094	0,068
0,267	0,506	0,532	-0,239	-0,265
0,900	0,506	0,532	0,394	0,368
0,717	0,506	0,532	0,211	0,185
0,000	0,506	0,532	-0,506	-0,532
0,900	0,506	0,532	0,394	0,368
0,400	0,506	0,532	-0,106	-0,132
0,800	0,506	0,532	0,294	0,268

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,519047619	0,547619048	0,576190476	(0,519;0,548;0,576)

36. Traditional contract forms

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
4	6	7	(4;;7)	(0,4;0,6;0,7)	0,583
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
9	7	5	(9;7;5)	(0,9;0,7;0,5)	0,700
2	3	5	(2;3;5)	(0,2;0,3;0,5)	0,317
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
6	3	2	(6;3;2)	(0,6;0,3;0,2)	0,333
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
4	6	7	(4;6;7)	(0,4;0,6;0,7)	0,583
2	5	8	(2;5;8)	(0,2;0,5;0,8)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,2	0,642857143	0,9	(0,200;0,643;0,900)	0,612	**Reject**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,65	0,9	(0,200;0,650;0,900)	0,617
0,2	0,636363636	0,9	(0,200;0,636;0,900)	0,608

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,600	0,617	0,612	-0,017	-0,012
0,583	0,617	0,612	-0,033	-0,029
0,600	0,617	0,612	-0,017	-0,012
0,900	0,617	0,612	0,283	0,288
0,300	0,617	0,612	-0,317	-0,312
0,783	0,617	0,612	0,167	0,171
0,700	0,617	0,612	0,083	0,088
0,317	0,617	0,612	-0,300	-0,295
0,800	0,617	0,612	0,183	0,188
0,883	0,617	0,612	0,267	0,271
0,333	0,608	0,612	-0,274	-0,279
0,800	0,608	0,612	0,192	0,188
0,500	0,608	0,612	-0,108	-0,112
0,600	0,608	0,612	-0,008	-0,012
0,583	0,608	0,612	-0,024	-0,029
0,500	0,608	0,612	-0,108	-0,112
0,800	0,608	0,612	0,192	0,188
0,700	0,608	0,612	0,092	0,088
0,900	0,608	0,612	0,292	0,288
0,500	0,608	0,612	-0,108	-0,112
0,800	0,608	0,612	0,192	0,188

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,604761905	0,642857143	0,676190476	(0,645;0,643;0,676)

37. Limited investment in research

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
4	4	4	(4;4;4)	(0,4;0,4;0,4)	0,400
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	7	7	(6;7;7)	(0,6;0,7;0,7)	0,683
9	7	5	(9;7;5)	(0,9;0,7;0,5)	0,700
2	4	7	(2;4;7)	(0,2;0,4;0,7)	0,417
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
7	8	9	(7;8;9)	(0,7;0,8;0,9)	0,800
7	5	4	(7;5;4)	(0,7;0,5;0,4)	0,517
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
6	6	6	(6;6;6)	(0,6;0,6;0,6)	0,600
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
1	2	2	(1;2;2)	(0,1;0,2;0,2)	0,183
5	7	9	(5;7;9)	(0,5;0,7;0,9)	0,700
7	8	8	(7;8;8)	(0,7;0,8;0,8)	0,783
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0,1	0,60952381	0,9	(0,100;0,610;0,900)	0,573	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0,2	0,57	0,9	(0,200;0,570;0,900)	0,563
0,1	0,645454545	0,9	(0,100;0,645;0,900)	0,597

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,400	0,563	0,573	-0,163	-0,173
0,500	0,563	0,573	-0,063	-0,073
0,300	0,563	0,573	-0,263	-0,273
0,800	0,563	0,573	0,237	0,227
0,700	0,563	0,573	0,137	0,127
0,683	0,563	0,573	0,120	0,110
0,700	0,563	0,573	0,137	0,127
0,417	0,563	0,573	-0,147	-0,156
0,400	0,563	0,573	-0,163	-0,173
0,800	0,563	0,573	0,237	0,227
0,517	0,597	0,573	-0,080	-0,056
0,800	0,597	0,573	0,203	0,227
0,600	0,597	0,573	0,003	0,027
0,600	0,597	0,573	0,003	0,027
0,183	0,597	0,573	-0,414	-0,390
0,700	0,597	0,573	0,103	0,127
0,783	0,597	0,573	0,186	0,210
0,700	0,597	0,573	0,103	0,127
0,900	0,597	0,573	0,303	0,327
0,500	0,597	0,573	-0,097	-0,073
0,800	0,597	0,573	0,203	0,227

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,566666667	0,60952381	0,647619048	(0,567;0,610;0,648)

38. Industry has low perceived innovation-drive level

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
5	8	9	(5;8;9)	(0,5;0,8;0,9)	0,767
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	8	8	(6;8;8)	(0,6;0,8;0,8)	0,767
8	6	5	(8;6;5)	(0,8;0,6;0,5)	0,617
2	4	8	(2;4;8)	(0,2;0,4;0,8)	0,433
4	5	6	(4;5;6)	(0,4;0,5;0,6)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
6	5	4	(6;5;4)	(0,6;0,5;0,4)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
10	10	10	(10;10;10)	(0,1;0,1;0,1)	1,000
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
0	1	1	(0;1;1)	(0,0;0,1;0,1)	0,083
2	4	7	(2;4;7)	(0,2;0,4;0,7)	0,417
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,561904762	1	(0,000;0,562;1,000)	0,541	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,61	0,9	(0,000;0,610;0,900)	0,557
0	0,518181818	1	(0,000;0,518;1,000)	0,512

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,800	0,557	0,541	0,243	0,259
0,767	0,557	0,541	0,210	0,225
0,000	0,557	0,541	-0,557	-0,541
0,700	0,557	0,541	0,143	0,159
0,700	0,557	0,541	0,143	0,159
0,767	0,557	0,541	0,210	0,225
0,617	0,557	0,541	0,060	0,075
0,433	0,557	0,541	-0,123	-0,108
0,500	0,557	0,541	-0,057	-0,041
0,800	0,557	0,541	0,243	0,259
0,500	0,512	0,541	-0,012	-0,041
0,800	0,512	0,541	0,288	0,259
1,000	0,512	0,541	0,488	0,459
0,600	0,512	0,541	0,088	0,059
0,083	0,512	0,541	-0,429	-0,458
0,417	0,512	0,541	-0,095	-0,125
0,500	0,512	0,541	-0,012	-0,041
0,000	0,512	0,541	-0,512	-0,541
0,800	0,512	0,541	0,288	0,259
0,000	0,512	0,541	-0,512	-0,541
1,000	0,512	0,541	0,488	0,459

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,514285714	0,561904762	0,604761905	(0,514;0,562;0,605)

39. Lack of recognition, promotion, and reward of creativity, quality of work, and innovation

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
6	8	10	(6;8;10)	(0,6;0,8;1,0)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
9	9	9	(9;9;9)	(0,9;0,9;0,9)	0,900
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
9	10	10	(9;10;10)	(0,9;1,0;1,0)	0,983
9	7	5	(9;7;5)	(0,9;0,7;0,5)	0,700
2	4	7	(2;4;7)	(0,2;0,4;0,7)	0,417
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
7	7	8	(7;7;8)	(0,7;0,7;0,8)	0,717
6	5	5	(6;5;5)	(0,6;0,5;0,5)	0,517
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
4	6	8	(4;6;8)	(0,4;0,6;0,8)	0,600
1	2	3	(1;2;3)	(0,1;0,2;0,3)	0,200
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
7	7	7	(7;7;7)	(0,7;0,7;0,7)	0,700

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,533333333	1	(0,000;0,533;1,000)	0,522	**Retain**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,64	1	(0,000;0,640;1,000)	0,593
0	0,436363636	1	(0,000;0,436;1,000)	0,458

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,700	0,593	0,522	0,107	0,178
0,800	0,593	0,522	0,207	0,278
0,000	0,593	0,522	-0,593	-0,522
0,900	0,593	0,522	0,307	0,378
0,700	0,593	0,522	0,107	0,178
0,983	0,593	0,522	0,390	0,461
0,700	0,593	0,522	0,107	0,178
0,417	0,593	0,522	-0,177	-0,106
0,500	0,593	0,522	-0,093	-0,022
0,717	0,593	0,522	0,123	0,194
0,517	0,458	0,522	0,059	-0,006
0,300	0,458	0,522	-0,158	-0,222
1,000	0,458	0,522	0,542	0,478
0,600	0,458	0,522	0,142	0,078
0,200	0,458	0,522	-0,258	-0,322
0,000	0,458	0,522	-0,458	-0,522
0,700	0,458	0,522	0,242	0,178
0,000	0,458	0,522	-0,458	-0,522
0,800	0,458	0,522	0,342	0,278
0,000	0,458	0,522	-0,458	-0,522
0,700	0,458	0,522	0,242	0,178

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,5	0,533333333	0,576190476	(0,500;0,533;0,576)

40. The building industry is project based

min (a)	opt (b)	max (c)	(...;...;...;)	(...;...;...;)	Crisp value individual (Sj)
1	1	1	(1;1;1)	(0,1;0,1;0,1)	0,100
0	1	2	(0;1;2)	(0,0;0,1;0,2)	0,100
5	5	5	(5;5;5)	(0,5;0,5;0,5)	0,500
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	9	9	(8;9;9)	(0,8;0,9;0,9)	0,883
2	2	2	(2;2;2)	(0,2;0,2;0,2)	0,200
3	5	7	(3;5;7)	(0,3;0,5;0,7)	0,500
3	4	5	(3;4;5)	(0,3;0,4;0,5)	0,400
5	6	6	(5;6;6)	(0,5;0,6;0,6)	0,583
2	1	1	(2;1;1)	(0,2;0,1;0,1)	0,117
3	3	3	(3;3;3)	(0,3;0,3;0,3)	0,300
10	10	10	(10;10;10)	(1,0;1,0;1,0)	1,000
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
2	4	4	(2;4;4)	(0,2;0,4;0,4)	0,367
2	4	6	(2;4;6)	(0,2;0,4;0,6)	0,400
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800
0	0	0	(0;0;0)	(0,0;0,0;0,0)	0,000
8	8	8	(8;8;8)	(0,8;0,8;0,8)	0,800

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value (Sj)**	**Retain/reject**
0	0,471428571	1	(0,000;0,471;1,000)	0,481	**Reject**

Min aj	Opt bj	Max cj	Opinion's mean	**Crisp value group (Sj)**
0	0,49	0,9	(0,000;0,490;0,900)	0,477
0	0,454545455	1	(0,000;0,455;1,000)	0,470

Crisp value individual (Sj)	Crisp value group (Sj)	Crisp value (Sj)	**Deviation from group**	**Deviation from total**
0,100	0,477	0,481	-0,377	-0,381
0,100	0,477	0,481	-0,377	-0,381
0,500	0,477	0,481	0,023	0,019
0,800	0,477	0,481	0,323	0,319
0,800	0,477	0,481	0,323	0,319
0,883	0,477	0,481	0,407	0,402
0,200	0,477	0,481	-0,277	-0,281
0,500	0,477	0,481	0,023	0,019
0,400	0,477	0,481	-0,077	-0,081
0,583	0,477	0,481	0,107	0,102
0,117	0,470	0,481	-0,353	-0,364
0,300	0,470	0,481	-0,170	-0,181
1,000	0,470	0,481	0,530	0,519
0,400	0,470	0,481	-0,070	-0,081
0,367	0,470	0,481	-0,103	-0,114
0,400	0,470	0,481	-0,070	-0,081
0,000	0,470	0,481	-0,470	-0,481
0,800	0,470	0,481	0,330	0,319
0,800	0,470	0,481	0,330	0,319
0,000	0,470	0,481	-0,470	-0,481
0,800	0,470	0,481	0,330	0,319

Average min (aj)	Average opt (bj)	Average max (cj)	**Range**
0,419047619	0,471428571	0,50952381	(0,419;0,471;0,510)

Appendix N Results survey two

Crisp value of attributes

ID code	Attribute	$\min_j\{a_{ij}\}$	$\frac{1}{n}\sum_{i=1}^{n} b_{ij}$	$\max_j\{c_{ij}\}$	$\frac{a_j + 4b_j + c_j}{6}$	Retained/rejected
	Attributes with a positive effect on innovation					
1	The organizational structure is arranged in a fashion that creates room for innovation.	0.000	0.695	1.000	0.630	Retained
2	Flexibility in the organizational structure (in space, planning, finance etc.).	0.000	0.662	1.000	0.608	Retained
3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge).	0.200	0.695	1.000	0.663	Retained
4	The organization accepts mistakes from its members.	0.200	0.662	1.000	0.641	Retained
5	Conflict between members are accepted and dealt with constructively.	0.000	0.500	1.000	0.500	Retained
6	The organization stimulates a critical attitude from members towards the status quo.	0.100	0.667	1.000	0.628	Retained
7	The organization uses projects to test and implement innovations.	0.100	0.719	1.000	0.663	Retained
8	The selection process of projects takes its innovative potential into account.	0.000	0.648	1.000	0.598	Retained
9	Business cases are created and are the foundation for project planning.	0.100	0.581	0.900	0.554	Retained
10	Project planning incorporates time for innovative activities.	0.000	0.0586	1.000	0.557	Retained
11	Top management support.	0.200	0.795	1.000	0.730	Retained
12	The organization performs intensive scanning activities.	0.200	0.695	1.000	0.663	Retained
13	The organization maintains contact with its network.	0.000	0.671	1.000	0.614	Retained
14	An entrepreneurial vision.	0.000	0.605	1.000	0.570	Retained
15	Entrepreneurial attitude and the performance of entrepreneurial activities are part of the organizational culture.	0.200	0.710	1.000	0.673	Retained
16	Employees are attracted to entrepreneurial activities.	0.100	0.705	0.900	0.637	Retained
17	The organization stimulates and encourages its members to act entrepreneurial.	0.100	0.695	1.000	0.647	Retained
18	The organization offers recourses to members to employ entrepreneurial activities.	0.200	0.729	1.000	0.686	Retained
19	Experts offer relevant knowledge to organizational members.	0.100	0.643	0.900	0.595	Retained
20	Members are stimulated to take risks.	0.200	0.595	0.900	0.580	Retained

21	The reward system takes into account the innovativeness and entrepreneurial activities of an employee.	0.100	0.643	1.000	0.612	Retained
22	The client creates space for innovation in a project.	0.000	0.657	1.000	0.605	Retained
23	Research and Development activities.	0.100	0.624	1.000	0.599	Retained
24	Promotion and enabling of integration in the value chain.	0.100	0.586	1.000	0.574	Retained
25	Draw attention to inspiring examples	0.100	0.643	1.000	0.612	Retained
26	Constant education of new and experienced employees (reflective practitioner)	0.200	0.657	1.000	0.638	Retained
27	Stimulate contact between generations; new, experienced, young, old employees.	0.100	0.695	1.000	0.647	Retained
28	Making innovation measurable	0.100	0.652	0.900	0.602	Retained
	Attributes with a negative effect on innovation					
29	The fragmented nature of the building process	-0.000	-0.595	-1.000	-0.563	Retained
30	The market structure	-0.000	-0.571	-0.900	-0.531	Retained
31	The dominant role of the client	-0.000	-0.562	-1.000	-0.541	Retained
32	Not enough coordination between practice and research	-0.000	-0.486	-1.000	-0.490	*Rejected*
33	Dependency on general economic conditions	-0.000	-0.400	-0.900	-0.417	*Rejected*
34	The costs of research	-0.000	-0.510	-0.800	-0.473	*Rejected*
35	Restrictions by laws and regulations	-0.000	-0.548	-1.000	-0.532	Retained
36	Traditional contract forms	-0.200	-0.643	-0.900	-0.612	Retained
37	Limited investment in research	-0.100	-0.610	-0.900	-0.573	Retained
38	Industry has low perceived innovation-drive level	-0.000	-0.562	-1.000	-0.541	Retained
39	Lack of recognition, promotion, and reward of creativity, quality of work, and innovation.	-0.000	-0.533	-1.000	-0.522	Retained
40	The building industry is project based	-0.000	-0.471	-1.000	-0.481	*Rejected*

Ranking the attributes

Rank	Attribute number	Attribute	Crisp value (S_j)
1	11	Top management support	0.730
2	18	The organization offers recourses to members to employ entrepreneurial activities	0.686
3	15	Entrepreneurial attitude and performance of entrepreneurial activities are part of the organizational culture	0.673
4	3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge)	0.663
4	7	The organization uses projects to test and implement innovations	0.663
4	12	The organization performs intensive scanning activities	0.663
7	17	The organization stimulates and encourages its members to act entrepreneurial	0.647
7	27	Stimulate contact between generations; new, experiences, young and old employees	0.647
9	4	The organization accepts mistakes from its members	0.641
10	26	Constant education of new and experiences employees (reflective practitioner)	0.638
11	16	Employees are attracted to entrepreneurial activities	0.637
12	1	The organizational structure is arranged in a fashion that creates room for innovation	0.630
13	6	The organization stimulates a critical attitude from members towards the status quo	0.628
14	13	The organization maintains contact with its network	0.614
15	21	The reward system takes into account the innovativeness and entrepreneurial activities of an employee	0.612
15	25	Draw attention to inspiring examples	0.612
17	2	Flexibility in the organization structure (in space, planning, finance etc.)	0.608
18	22	The client creates space for innovation in a project	0.605
19	28	Making innovation measurable	0.602
20	23	Research and Development activities	0.599
21	8	The selection process if projects takes its innovative potential into account	0.598
22	19	Experts offer relevant knowledge to organizational members	0.595
23	20	Members are stimulated to take risks	0.580
24	24	Promotion and enabling of integration in the value chain	0.574
25	14	An entrepreneurial vision	0.570
26	10	Project planning incorporates time for innovative activities	0.557
27	9	Business cases are created and are the foundation for project planning	0.554
28	5	Conflict between members are accepted and dealt with constructively	0.500

Overview and ranking of the retained attributes with a negative effect on innovativeness

Rank	Attribute number	Attribute	Crisp value (S_j)
1	36	Traditional contract forms	-0.612
2	37	Limited investment in research	-0.573
3	29	The fragmented nature of the building industry	-0.553
4	31	The role of the client	-0.541
4	38	The industry has a low perceived innovation-drive level	-0.541
6	35	Restrictions by laws and regulations	-0.532
7	30	The market structure	-0.531
8	39	Lack of recognitions, promotion, and reward of creativity, quality of work, and innovation.	-0.522

Consensus amongst experts on retained attributes (deviation > 0.2 from Sj)

Attribute number	Consensus level	Consensus per expert																				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	76 %	-	x	-	x	-	x	x	x	x	x	x	x	-	x	x	x	x	x	-	x	x
2	86 %	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	-	x	x
3	76 %	x	x	x	-	-	-	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x
4	86 %	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	x
5	76 %	x	-	x	-	-	x	x	x	x	x	x	x	x	x	x	x	-	x	x	x	-
6	81 %	x	x	x	-	x	-	x	x	x	x	x	x	-	x	x	x	x	x	-	x	x
7	71 %	-	x	-	-	x	x	x	x	x	x	x	x	-	x	x	-	x	x	-	x	x
8	71 %	-	x	-	-	-	x	x	x	x	x	x	x	-	x	x	x	-	x	x	x	x
9	76 %	x	x	x	x	x	x	x	x	-	x	x	-	x	x	x	-	x	x	-	x	-
10	81 %	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	x	-
11	71 %	-	x	-	-	x	x	x	x	x	x	x	x	-	x	x	x	x	-	x	-	x
12	81 %	x	x	x	-	x	x	x	x	x	x	x	x	x	-	x	-	x	x	-	x	x
13	62 %	-	-	x	-	x	-	x	x	x	x	x	x	-	-	x	-	x	x	-	x	x
14	76 %	x	x	x	-	x	-	x	x	x	x	x	x	x	x	-	-	x	x	-	x	x
15	76 %	-	x	x	-	-	x	x	x	x	x	x	x	x	x	-	x	x	-	x	x	x
16	86 %	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	x	-	x	x
17	81 %	-	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	x	-	x	x
18	71 %	x	x	-	-	-	x	x	x	x	x	x	x	x	x	-	x	x	-	-	x	x
19	71 %	x	-	-	-	-	x	x	x	x	x	x	x	x	-	x	x	-	x	x	x	x
20	90 %	x	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	x
21	86 %	x	x	x	-	x	-	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
22	62 %	-	x	-	-	x	-	x	x	x	x	x	-	-	x	x	x	x	-	x	-	x
23	57 %	-	-	x	-	x	-	x	x	x	-	x	x	x	-	x	-	-	x	-	x	x
24	57 %	-	-	x	-	x	x	-	x	x	x	x	x	x	x	-	-	-	x	-	x	-
25	81 %	-	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	-	x	x
26	90 %	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
27	71 %	x	-	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	-	-	x	-
28	52 %	-	x	-	-	x	-	-	x	-	x	-	-	x	x	-	x	x	x	-	x	x
29	62 %	-	x	x	-	-	x	x	x	x	x	x	-	x	x	x	-	x	-	-	x	-
30	57 %	x	x	x	-	-	-	-	x	x	x	x	x	x	x	x	-	x	-	-	-	-
31	52 %	-	-	-	-	-	-	x	x	x	x	x	x	x	x	-	x	x	x	-	-	-
35	48 %	-	-	x	x	x	-	-	x	x	x	-	x	-	x	-	-	x	-	-	x	-
36	71 %	x	x	x	-	-	x	x	-	x	-	-	x	x	x	x	x	x	x	-	x	x
37	62 %	x	x	-	-	x	x	x	x	x	-	x	-	x	x	-	x	-	x	-	x	-
38	43 %	-	-	-	x	x	-	x	x	x	-	x	-	-	x	-	x	x	-	-	-	-
39	48 %	x	-	-	-	x	-	x	x	x	x	x	-	-	x	-	-	x	-	-	-	x
Consensus level expert		53 %	72 %	61 %	25 %	64 %	64 %	89 %	97 %	92 %	89 %	92 %	81 %	72 %	89 %	58 %	67 %	81 %	70 %	22 %	81 %	70 %

Internal consensus: group consensus amongst Innovation managers on retained attributes (deviation > 0.2 from Sj groupIM)

Attribute number	Consensus level group: innovation managers	Consensus expert									
		1	2	3	4	5	6	7	8	9	10
1	60 %	-	-	-	x	-	x	x	x	x	x
2	80 %	x	x	x	-	-	x	x	x	x	x
3	50 %	x	x	x	-	-	-	x	x	-	
4	90 %	-	x	x	x	x	x	x	x	x	x
5	80 %	x	-	x	x	-	x	x	x	x	x
6	80 %	x	x	x	-	x	-	x	x	x	x
7	80 %	-	x	-	x	x	x	x	x	x	x
8	100 %	x	x	x	x	x	x	x	x	x	x
9	80 %	x	x	x	-	x	x	x	x	-	x
10	100%	x	x	x	x	x	x	x	x	x	x
11	60 %	-	x	-	-	-	x	x	x	x	x
12	90 %	x	x	x	-	x	x	x	x	x	x
13	60 %	-	-	x	-	x	-	x	x	x	x
14	90 %	x	x	x	-	x	x	x	x	x	x
15	80 %	-	x	x	x	-	x	x	x	x	x
16	90 %	x	x	x	-	x	x	x	x	x	x
17	80 %	-	x	x	-	x	x	x	x	x	x
18	70 %	x	x	-	-	-	x	x	x	x	x
19	60 %	x	-	-	-	-	x	x	x	x	x
20	90 %	x	x	x	-	x	x	x	x	x	x
21	80 %	x	x	x	-	x	-	x	x	x	x
22	50 %	-	x	-	-	x	-	-	x	x	x
23	50 %	-	-	x	-	x	-	x	x	x	-
24	70 %	-	-	x	-	x	x	x	x	x	x
25	80 %	x	x	x	-	-	x	x	x	x	x
26	90 %	x	x	x	-	x	x	x	x	x	x
27	80 %	x	-	x	x	-	x	x	x	x	x
28	30 %	-	x	-	-	-	-	-	x	-	x
29	70 %	-	x	x	-	-	x	x	x	x	x
30	60 %	x	x	x	-	-	-	-	x	x	x
31	40 %	-	x	-	-	-	-	-	x	x	x
35	60 %	-	-	x	x	x	-	-	x	x	x
36	60 %	x	x	x	-	-	x	x	-	x	-
37	70 %	x	x	-	-	x	x	x	x	x	-
38	50 %	-	-	-	x	x	-	x	x	x	-
39	60 %	x	-	-	-	x	-	x	x	x	x
Consensus level expert		58%	72%	69%	28%	58%	67%	86%	97%	92%	86%

Internal consensus; group consensus amongst Top managers on retained attributes (deviation >0.2 from Sj group TM)

Attribute number	Consensus level group: innovation managers	Consensus expert										
		11	12	13	14	15	16	17	18	19	20	21
1	82 %	x	x	-	x	x	x	x	x	-	x	x
2	91 %	x	x	x	x	x	x	x	x	-	x	x
3	91 %	x	x	x	x	x	x	x	x	-	x	x
4	82 %	x	x	x	x	x	x	x	x	-	-	x
5	73 %	x	x	x	x	x	x	-	x	-	x	-
6	82 %	x	x	-	x	x	x	x	x	-	x	x
7	73 %	x	x	-	x	x	-	x	x	-	x	x
8	91 %	x	x	-	x	x	x	x	x	x	x	x
9	73 %	x	-	x	x	x	-	x	x	-	x	x
10	36 %	-	-	x	x	x	-	-	-	-	x	-
11	82 %	x	x	-	x	x	x	x	x	x	-	x
12	82 %	x	x	-	x	x	x	x	x	x	-	x
13	73 %	x	x	-	x	x	-	x	x	-	x	x
14	73 %	x	x	x	x	-	-	x	x	-	x	x
15	82 %	x	x	x	x	-	x	x	-	x	x	x
16	82 %	x	x	x	x	-	x	x	x	-	x	x
17	82 %	x	x	x	x	-	x	x	x	-	x	x
18	73 %	x	x	x	x	-	x	x	-	-	x	x
19	100 %	x	x	x	x	x	x	x	x	x	x	x
20	91 %	x	x	x	x	x	x	x	x	-	x	x
21	91 %	x	x	x	x	-	x	x	x	x	x	x
22	55 %	x	x	-	x	x	x	-	-	-	-	x
23	91 %	x	x	x	x	x	x	x	x	-	x	x
24	64 %	x	x	-	x	-	-	x	x	-	x	x
25	91 %	x	x	x	x	x	x	x	x	-	x	x
26	91 %	x	x	x	x	-	x	x	x	x	x	x
27	64 %	x	x	x	x	-	x	x	-	-	x	-
28	64 %	-	-	x	x	-	x	x	x	-	x	x
29	55 %	x	-	x	x	x	-	x	-	-	x	-
30	55 %	x	x	x	x	x	-	x	-	-	-	-
31	55 %	x	x	x	x	-	-	x	x	-	-	-
35	27 %	-	x	-	x	-	-	-	-	-	x	-
36	82 %	-	x	x	x	x	x	x	x	-	x	x
37	64 %	x	-	x	x	-	x	x	x	-	x	-
38	27 %	x	-	-	-x	-	x	x	-	-	-	-
39	27 %	x	x	-	x	-	-	-	-	-	-	-
Consensus level expert		89%	83%	67%	97%	58%	69%	86%	72%	19%	78%	72%

Distribution range of attributes

Rank	Attribute number	Attribute	Distribution	Direction	Rank of importance
1	1	The organizational structure is arranged in a fashion that creates room for innovation.	0.291	Positive	12
2	4	The organization accepts mistakes from its members.	0.238	Positive	9
3	6	The organization stimulates a critical attitude from members towards the status quo.	0.233	Positive	13
4	7	The organization uses projects to test and implement innovations.	0.229	Positive	4
5	25	Draw attention to inspiring examples	0.224	Positive	15
6	21	The reward system takes into account the innovativeness and entrepreneurial activities of an employee.	0.210	Positive	15
7	26	Constant education of new and experienced employees (reflective practitioner)	0.200	Positive	10
8	8	The selection process of projects takes its innovative potential into account.	0.195	Positive	21
9	10	Project planning incorporates time for innovative activities.	0.190	Positive	26
9	13	The organization maintains contact with its network.	0.190	Positive	14
9	2	Flexibility in the organizational structure (in space, planning, finance etc.).	0.190	Positive	17
12	9	Business cases are created and are the foundation for project planning.	0.186	Positive	27
13	22	The client creates space for innovation in a project.	0.186	Positive	18
14	12	The organization performs intensive scanning activities.	0.181	Positive	4
15	15	Entrepreneurial attitude and the performance of entrepreneurial activities are part of the organizational culture.	0.181	Positive	3
16	24	Promotion and enabling of integration in the value chain.	0.181	Positive	24
17	27	Stimulate contact between generations; new, experienced, young, old employees.	0.181	Positive	7
18	3	The organization offers resources to stimulate innovative activities performed by members (such as financial aid and knowledge).	0.167	Positive	4
19	14	An entrepreneurial vision.	0.162	Positive	25
20	19	Experts offer relevant knowledge to organizational members.	0.162	Positive	22
21	23	Research and Development activities.	0.162	Positive	20
22	16	Employees are attracted to entrepreneurial activities.	0.161	Positive	11
23	5	Conflict between members are accepted and dealt with constructively.	0.157	Positive	28
24	20	Members are stimulated to take risks.	0.153	Positive	23
25	34	The costs of research	0.148	Negative	11
26	28	Making innovation measurable	0.148	Positive	19
27	18	The organization offers recourses to members to employ entrepreneurial activities.	0.147	Positive	2
28	11	Top management support.	0.140	Positive	1
29	17	The organization stimulates and encourages its members to act entrepreneurial.	0.128	Positive	7
30	29	The fragmented nature of the building process	0.100	Negative	3
31	31	The dominant role of the client	0.100	Negative	4
32	40	The building industry is project based	0.091	Negative	10
33	38	Industry has low perceived innovation-drive level	0.091	Negative	4
34	37	Limited investment in research	0.081	Negative	2
35	39	Lack of recognition, promotion, and reward of creativity, quality of work, and innovation.	0.076	Negative	8
36	32	Not enough coordination between practice and research	0.072	Negative	9
37	30	The market structure	0.071	Negative	7
38	33	Dependency on general economic conditions	0.067	Negative	12
39	35	Restrictions by laws and regulations	0.057	Negative	6
40	36	Traditional contract forms	0.031	Negative	1

Deviations between innovation management and top management

Attribute number	Crisp value (S_j)	Crisp value innovation management ($S_{j_groupIM}$)	Crisp value top management ($S_{j_groupTM}$)	Deviation crisp value innovation management and crisp value top management ($S_{j_groupIM}$- $S_{j_groupTM}$)
1	0,630	0,64	0,621	0,019
2	0,608	0,587	0,661	-0,074
3	0,663	0,673	0,671	0,002
4	0,641	0,653	0,63	0,023
5	0,5	0,507	0,461	0,046
6	0,628	0,63	0,642	-0,012
7	0,663	0,697	0,662	0,035
8	0,598	0,667	0,567	0,1
9	0,554	0,53	0,574	-0,044
10	0,557	0,65	0,485	0,165
11	0,73	0,7	0,791	-0,091
12	0,663	0,633	0,708	-0,075
13	0,614	0,627	0,633	-0,006
14	0,57	0,63	0,53	0,1
15	0,673	0,687	0,661	0,026
16	0,673	0,633	0,656	-0,023
17	0,647	0,613	0,679	-0,066
18	0,686	0,693	0,679	0,014
19	0,595	0,573	0,632	-0,059
20	0,58	0,583	0,577	0,006
21	0,612	0,61	0,614	-0,004
22	0,605	0,62	0,591	0,029
23	0,599	0,557	0,655	-0,098
24	0,574	0,507	0,636	-0,129
25	0,612	0,563	0,689	-0,126
26	0,638	0,637	0,638	-0,001
27	0,647	0,61	0,697	-0,087
28	0,602	0,6	0,603	-0,003
29	-0,563	-0,63	-0,532	-0,098
30	-0,531	-0,583	-0,514	-0,069
31	-0,541	-0,613	-0,489	-0,124
32	-0,49	-0,473	-0,489	0,016
33	-0,417	-0,443	-0,376	-0,067
34	-0,473	-0,573	-0,412	-0,161
35	-0,532	-0,56	-0,506	-0,054
36	-0,612	-0,617	-0,608	-0,009
37	-0,573	-0,573	-0,597	0,024
38	-0,541	-0,557	-0,512	-0,045
39	-0,522	-0,593	-0,458	-0,135
40	-0,481	-0,477	-0,47	-0,007

Appendix O Welch's t-test

		Sum of Squares	df	Mean Square	F	Sig.
Att1	Between Groups	,006	1	,006	,188	,670
	Within Groups	,560	19	,029		
	Total	,565	20			
Att2	Between Groups	,016	1	,016	,885	,359
	Within Groups	,342	19	,018		
	Total	,357	20			
Att3	Between Groups	,007	1	,007	,277	,604
	Within Groups	,469	19	,025		
	Total	,476	20			
Att4	Between Groups	,011	1	,011	,374	,548
	Within Groups	,581	19	,031		
	Total	,592	20			
Att5	Between Groups	,005	1	,005	,105	,750
	Within Groups	,862	19	,045		
	Total	,867	20			
Att6	Between Groups	,000	1	,000	,003	,958
	Within Groups	,532	19	,028		
	Total	,532	20			
Att7	Between Groups	,000	1	,000	,011	,919
	Within Groups	,492	19	,026		
	Total	,492	20			
Att8	Between Groups	,050	1	,050	1,326	,264
	Within Groups	,716	19	,038		
	Total	,766	20			
Att9	Between Groups	,059	1	,059	2,526	,128
	Within Groups	,441	19	,023		
	Total	,500	20			
Att10	Between Groups	,087	1	,087	1,858	,189
	Within Groups	,889	19	,047		
	Total	,976	20			
Att11	Between Groups	,027	1	,027	1,119	,304
	Within Groups	,460	19	,024		
	Total	,487	20			
Att12	Between Groups	,028	1	,028	1,394	,252
	Within Groups	,388	19	,020		
	Total	,417	20			
Att13	Between Groups	,014	1	,014	,235	,633
	Within Groups	1,100	19	,058		
	Total	1,114	20			
Att14	Between Groups	,089	1	,089	2,255	,150
	Within Groups	,748	19	,039		
	Total	,837	20			
Att15	Between Groups	,011	1	,011	,441	,515
	Within Groups	,456	19	,024		
	Total	,466	20			
Att16	Between Groups	,000	1	,000	,010	,921
	Within Groups	,402	19	,021		
	Total	,402	20			
Att17	Between Groups	,013	1	,013	,411	,529
	Within Groups	,620	19	,033		
	Total	,633	20			
Att18	Between Groups	,003	1	,003	,080	,781
	Within Groups	,673	19	,035		
	Total	,676	20			
Att19	Between Groups	,017	1	,017	,511	,484
	Within Groups	,628	19	,033		
	Total	,645	20			
Att20	Between Groups	,002	1	,002	,097	,759
	Within Groups	,328	19	,017		
	Total	,330	20			

Att21	Between Groups	,000	1	,000	,000	,991
	Within Groups	,417	19	,022		
	Total	,417	20			
Att22	Between Groups	,014	1	,014	,185	,672
	Within Groups	1,425	19	,075		
	Total	1,439	20			
Att23	Between Groups	,070	1	,070	1,705	,207
	Within Groups	,776	19	,041		
	Total	,846	20			
Att24	Between Groups	,096	1	,096	2,354	,141
	Within Groups	,771	19	,041		
	Total	,867	20			
Att25	Between Groups	,099	1	,099	5,107	,036
	Within Groups	,367	19	,019		
	Total	,466	20			
Att26	Between Groups	,014	1	,014	,653	,429
	Within Groups	,412	19	,022		
	Total	,426	20			
Att27	Between Groups	,049	1	,049	1,427	,247
	Within Groups	,647	19	,034		
	Total	,695	20			
Att28	Between Groups	,000	1	,000	,000	,997
	Within Groups	,888	19	,047		
	Total	,888	20			
Att29	Between Groups	,009	1	,009	,175	,680
	Within Groups	1,021	19	,054		
	Total	1,031	20			
Att30	Between Groups	,010	1	,010	,148	,705
	Within Groups	1,284	19	,068		
	Total	1,294	20			
Att31	Between Groups	,059	1	,059	,899	,355
	Within Groups	1,246	19	,066		
	Total	1,305	20			
Att32	Between Groups	,010	1	,010	,146	,707
	Within Groups	1,330	19	,070		
	Total	1,341	20			
Att33	Between Groups	,028	1	,028	,288	,598
	Within Groups	1,837	19	,097		
	Total	1,864	20			
Att34	Between Groups	,196	1	,196	3,908	,063
	Within Groups	,955	19	,050		
	Total	1,152	20			
Att35	Between Groups	,034	1	,034	,398	,535
	Within Groups	1,628	19	,086		
	Total	1,662	20			
Att36	Between Groups	,000	1	,000	,011	,918
	Within Groups	,708	19	,037		
	Total	,708	20			
Att37	Between Groups	,029	1	,029	,772	,391
	Within Groups	,704	19	,037		
	Total	,733	20			
Att38	Between Groups	,043	1	,043	,422	,524
	Within Groups	1,920	19	,101		
	Total	1,963	20			
Att39	Between Groups	,218	1	,218	2,093	,164
	Within Groups	1,974	19	,104		
	Total	2,192	20			
Att40	Between Groups	,006	1	,006	,057	,814
	Within Groups	1,972	19	,104		
	Total	1,978	20			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Att1	Welch	,183	1	16,975	,674
Att2	Welch	,879	1	18,438	,361
Att3	Welch	,270	1	16,860	,610
Att4	Welch	,389	1	17,589	,541
Att5	Welch	,110	1	16,535	,744
Att6	Welch	,003	1	18,216	,958
Att7	Welch	,011	1	18,740	,919
Att8	Welch	1,422	1	13,695	,253
Att9	Welch	2,494	1	18,085	,132
Att10	Welch	2,014	1	12,343	,181
Att11	Welch	1,096	1	17,423	,309
Att12	Welch	1,401	1	18,953	,251
Att13	Welch	,244	1	17,614	,627
Att14	Welch	2,396	1	14,943	,143
Att15	Welch	,457	1	17,679	,508
Att16	Welch	,011	1	17,631	,919
Att17	Welch	,414	1	18,978	,528
Att18	Welch	,080	1	18,965	,780
Att19	Welch	,489	1	14,848	,495
Att20	Welch	,095	1	17,824	,761
Att21	Welch	,000	1	18,162	,991
Att22	Welch	,187	1	18,998	,671
Att23	Welch	1,611	1	13,335	,226
Att24	Welch	2,344	1	18,616	,143
Att25	Welch	5,043	1	18,071	,037
Att26	Welch	,667	1	18,785	,424
Att27	Welch	1,442	1	19,000	,245
Att28	Welch	,000	1	18,666	,997
Att29	Welch	,179	1	18,824	,677
Att30	Welch	,155	1	16,971	,699
Att31	Welch	,898	1	18,742	,355
Att32	Welch	,146	1	18,905	,706
Att33	Welch	,295	1	18,580	,593
Att34	Welch	4,122	1	15,859	,059
Att35	Welch	,401	1	18,960	,534
Att36	Welch	,011	1	17,563	,919
Att37	Welch	,777	1	18,975	,389
Att38	Welch	,438	1	17,564	,517
Att39	Welch	2,143	1	18,648	,160
Att40	Welch	,058	1	18,853	,813

a. Asymptotically F distributed.

Kruskal-Wallis Test

Ranks

	Group	N	Mean Rank
Att1	Innovation management	10	11,45
	Top management	11	10,59
	Total	21	
Att2	Innovation management	10	9,50
	Top management	11	12,36
	Total	21	
Att3	Innovation management	10	12,05
	Top management	11	10,05
	Total	21	
Att4	Innovation management	10	11,60
	Top management	11	10,45
	Total	21	
Att5	Innovation management	10	11,30
	Top management	11	10,73
	Total	21	
Att6	Innovation management	10	11,30
	Top management	11	10,73
	Total	21	
Att7	Innovation management	10	11,00
	Top management	11	11,00
	Total	21	
Att8	Innovation management	10	12,60
	Top management	11	9,55
	Total	21	
Att9	Innovation management	10	8,70
	Top management	11	13,09
	Total	21	
Att10	Innovation management	10	12,10
	Top management	11	10,00
	Total	21	
Att11	Innovation management	10	9,20
	Top management	11	12,64
	Total	21	
Att12	Innovation management	10	9,55
	Top management	11	12,32
	Total	21	
Att13	Innovation management	10	9,65
	Top management	11	12,23
	Total	21	
Att14	Innovation management	10	13,00
	Top management	11	9,18
	Total	21	
Att15	Innovation management	10	11,75
	Top management	11	10,32
	Total	21	
Att16	Innovation management	10	10,10
	Top management	11	11,82
	Total	21	
Att17	Innovation management	10	9,60
	Top management	11	12,27
	Total	21	
Att18	Innovation management	10	10,95
	Top management	11	11,05
	Total	21	
Att19	Innovation management	10	10,10
	Top management	11	11,82
	Total	21	
Att20	Innovation management	10	11,30
	Top management	11	10,73
	Total	21	
Att21	Innovation management	10	10,55
	Top management	11	11,41
	Total	21	
Att22	Innovation management	10	11,60
	Top management	11	10,45
	Total	21	
Att23	Innovation management	10	9,65
	Top management	11	12,23
	Total	21	
Att24	Innovation management	10	8,75
	Top management	11	13,05
	Total	21	
Att25	Innovation management	10	8,25
	Top management	11	13,50
	Total	21	
Att26	Innovation management	10	9,15
	Top management	11	12,68
	Total	21	
Att27	Innovation management	10	9,20
	Top management	11	12,64
	Total	21	
Att28	Innovation management	10	10,80
	Top management	11	11,18
	Total	21	
Att29	Innovation management	10	11,50
	Top management	11	10,55
	Total	21	
Att30	Innovation management	10	10,75
	Top management	11	11,23
	Total	21	
Att31	Innovation management	10	12,35
	Top management	11	9,77
	Total	21	
Att32	Innovation management	10	10,65
	Top management	11	11,32
	Total	21	
Att33	Innovation management	10	11,60
	Top management	11	10,45
	Total	21	
Att34	Innovation management	10	13,50
	Top management	11	8,73
	Total	21	
Att35	Innovation management	10	11,70
	Top management	11	10,36
	Total	21	
Att36	Innovation management	10	11,30
	Top management	11	10,73
	Total	21	
Att37	Innovation management	10	9,55
	Top management	11	12,32
	Total	21	
Att38	Innovation management	10	11,60
	Top management	11	10,45
	Total	21	
Att39	Innovation management	10	12,90
	Top management	11	9,27
	Total	21	
Att40	Innovation management	10	11,60
	Top management	11	10,45
	Total	21	

Appendix P The tool

This appendix is in Dutch because the target group for this guideline is Dutch.

De innovatief ondernemerschap 's tool – Handleiding

Innovatief ondernemerschap is een belangrijke mogelijkheid voor het stimuleren van innovatie in uw bedrijf. Het concept gaat uit van de innovatieve kracht die er in de organisatie aanwezig is; het gebruik maken van de kennis en innovatieve ideeën van medewerkers en het stimuleren en faciliteren om deze ideeën om te zetten in een innovatieve realiteit.

Het concept is in zeer innovatieve omgevingen al bekend (onder de naam 'Corporate Entrepreneurship') en wordt veel toegepast om innovatie een boost te geven. Omgevingen die hoog scoren op innovatief ondernemerschap gebruiken het als een constante bron van vernieuwing en ontwikkeling, en zien het als essentieel om concurrentievoordeel te krijgen en te behouden.

Deze tool meet uw huidige prestatie op dit gebied. Wat doet uw organisatie om innovatief ondernemerschap te stimuleren en te faciliteren? Waar zijn mogelijkheden voor verbetering?

Deze tool is ontwikkeld in het kader van het afstudeeronderzoek 'Building innovation', van Andrea Snijders. Dit onderzoek heeft diverse factoren en hun impact geïdentificeerd die een positief effect hebben op de innovatie kracht van uw bedrijf. Deze vormen de basis voor de tool.

De tool

De tool is te vinden op www.ondernemenindebouw.nl. U evalueert uw organisatie aan de hand van 26 indicatoren, die u een score geeft van 0 tot 10. Deze scores worden vervolgens doorgerekend, en u krijgt een totaal score van 0 tot 100. Deze score geeft aan hoe u nu scoort op innovatief ondernemerschap. Ook krijgt u uw score in vijf categorieën te zien; (1) het stimuleren van innovatief denken en handelen, (2) bedrijfsstructuur, (3) bedrijfscultuur, (4) omgaan met projecten en (5) overige.

Let op! Een kritische blik is bij het invullen van de vragen essentieel. Geen wensdenken, maar evalueren wat er daadwerkelijk nu gebeurt binnen uw organisatie. Zonder waarheidsgetrouwe antwoorden zal deze tool u niets opleveren.

Invullen – stappen om te doorlopen

1. Open de tool in Excel, open de tab 'invullen'.
2. Beantwoord de vragen als volgt.
   a. Lees de indicator.
   b. Onder 'uitleg' staat wanneer een organisatie 0 scoort op de indicator, en wanneer hij 10 scoort.
   c. Bedenk wat uw organisatie doet op het gebiedt van de indicator.
   d. Schaal uw organisatie in op de schaal 0 tot 10
   e. Vult u antwoord in onder 'uw score'.
3. Beantwoord alle 26 vragen.
4. In de tab 'Resultaat' kunt u zien wat uw totaal score is op een schaal 0 tot 100. Ook kunt u hier zien hoe u scoort in de verschillende categorieën. Naast uw numerieke score, is er ook aangegeven welk percentage u haalt in totaal en in de specifieke categorieën.
5. Speel met de resultaten! Kijk wat er gebeurt met uw totaal score als u in bij de indicatoren aan de knoppen draait. Wat heeft veel effect, wat weinig? Waar valt voor u nog veel winst te behalen? Zo geeft de tool u niet alleen inzicht in uw huidige situatie maar ook in mogelijkheden voor de toekomst. Kijk voor meer informatie hierover onder 'wat zegt uw score?'.

Analyse – hoe werkt het?

Deze tool baseert zich op diverse wetenschappelijk bronnen. Het is hoofdzakelijk gebaseerd op het afstudeeronderzoek 'Building innovation' van Andrea

Snijders. Uw score op innovatief ondernemerschap wordt als volgt berekend;

Het antwoord op uw vraag is de 'effort', de inspanning die uw bedrijf verricht op het gebied van de indicator. Deze wordt omgezet in de impact die deze inspanning heeft. Deze stap is van belang, omdat een bepaalde inspanning niet altijd een even groot totaal effect bereikt.

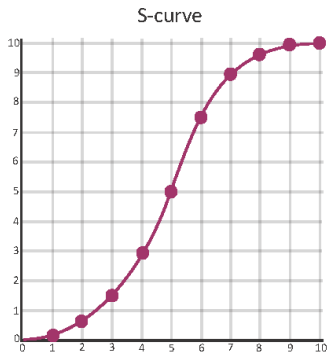
Voorbeeld
U kunt zich dit als volgt voorstellen; bij de indicator 'de organisatie stimuleert een ondernemende houding' is het zo dat er een bepaalde hoeveelheid stimulatie nodig is voordat een ondernemende houding ook daadwerkelijk wordt ontwikkeld. Het enkel noemen ervan in de nieuwjaarstoespraak, zal weinig daadwerkelijk verandering opleveren. Er is dus een bepaalde inspanning nodig om effect te gaan sorteren.

Tegelijk is het zo dat het steeds minder toegevoegde waarde heeft naarmate er een bepaalde stimulans is bereikt. Als u al veel stimuleert, zal extra stimulatie niet evenredig tot meer innovatie leidde.

Deze gegevens gecombineerd levert de impact-effort grafiek op, in het geval van het voorbeeld een S curve.

Deze curve laat zien dat een kleine inspanning weinig resultaat oplevert, bij een gemiddelde inspanning stijgt de impact snel. Bij een grote inspanning of een hele grote inspanning neemt de toegevoegde waarde weer wat af. In het voorbeeld; vult u een inspanningsscore in van 4, dan vertaald het model dit naar een impact-score van 3. Deze curves van de verschillende indicatoren vindt u terug in de bijlage.

Nu heeft het model dus de impact score. Deze impact score wordt vervolgens vermenigvuldigd met het effect wat de bepaalde indicator heeft op innovatie binnen uw bedrijf. Deze effect-score is bepaald met behulp van enquêtes.



x	f(x)
1	0.2
2	0.7
3	1.7
4	3
5	5
6	7.5
7	9
8	9.5
9	9.8
10	10

Voorbeeld
Bij de indicator 'de organisatie stimuleert een ondernemende houding' heeft u een inspanning score van 4 ingevuld, wat een impact-score van 3 oplevert. Deze score wordt vervolgens vermenigvuldigd met het effect van deze indicator op innovatie. Dit is 5.70. Uw komt nu uit op een puntenaantal van 1.71 voor deze indicator. Het maximaal aantal punten wat u kon score was 5.70.

De verschillende scores worden vermenigvuldigt met een correctiefactor. Deze zorgt ervoor dat er een totaal van 100 punten te behalen is voor alle indicatoren.

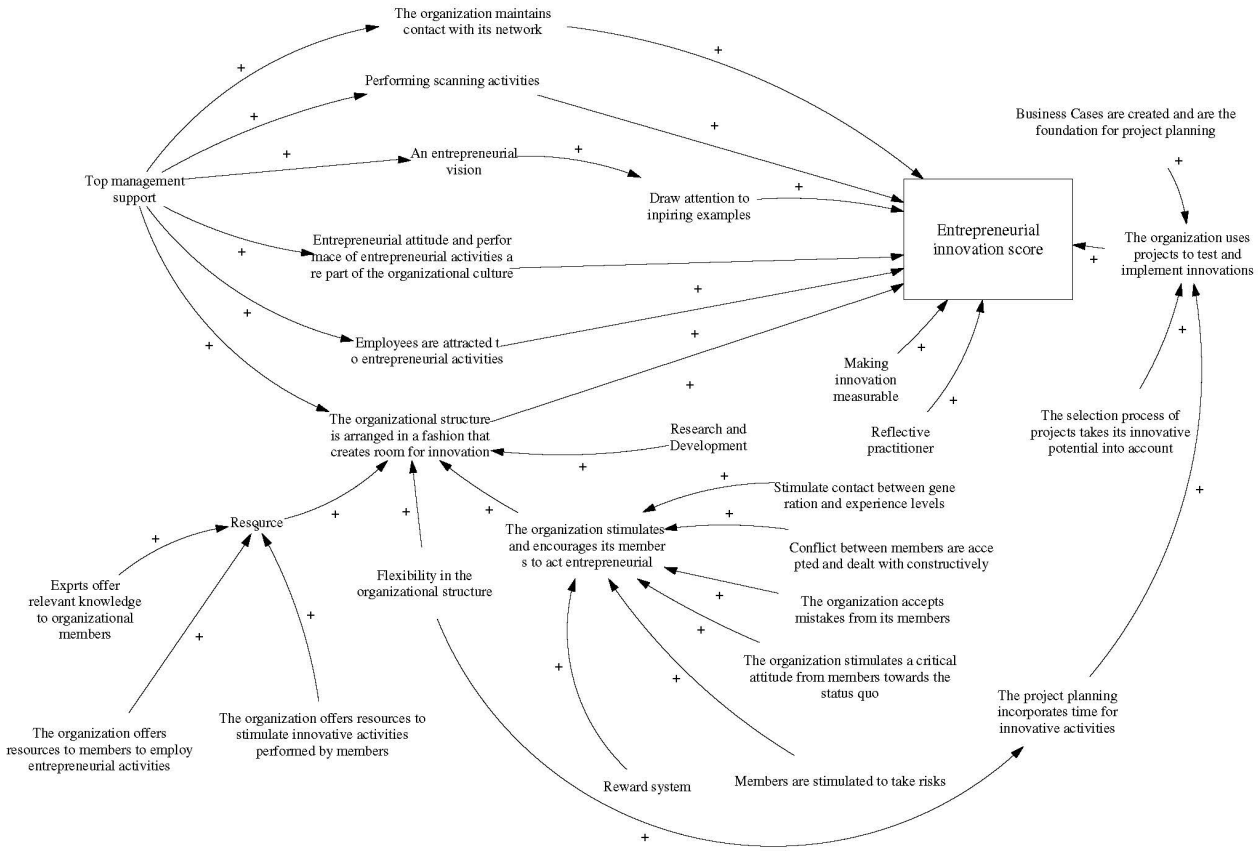
Uw score op de verschillende indicatoren worden allemaal op deze wijze berekend. Daarna worden ze opgeteld en geven zo op schaal 0 tot 100 aan hoe innovatief ondernemend uw bedrijf is.

Wat zegt uw score?

Hebt u de tool ingevuld? Dan hebt u de eerste stap gezet richting een meer innovatieve organisatie. Of u nou laag of hoog scoort, het is vooral van belang dat u iets wilt veranderen, dat u wilt dat uw organisatie relevant blijft in de markt en dat innovatie een integraal deel uitmaakt van uw concurrentievoordeel. Uw score valt in een van de volgende categorieën, de bijbehorende adviezen zijn op de volgende pagina's te vinden:

Score 0 tot 40 – lage score
Score 40 tot 70 – lage tot midden score
Score 70 tot 90 – hoge score
Score 100 – perfect?

Belangrijk bij het trekken van conclusies uit uw score is onderstaand model. De indicatoren in de tool staan natuurlijk niet op zichzelf. Ze hebben allemaal invloed op elkaar. Deze invloed is in het model niet meegenomen, maar is wel belangrijk wanneer u verbeteringen gaat aanbrengen in uw prestatie op het gebied van innovatief ondernemerschap. Bekijk daarom onderstaande figuur goed voordat u aan de slag gaat met uw resultaten.



Score 0 tot 40

U scoort laag op innovatief ondernemerschap. Stel eerste vast hoe dit komt, scoort u in een bepaalde categorie laag, of in het algemeen? Richt u op de indicatoren waar u heel laag scoort, en evalueer deze. Bekijk wat u kunt doen om deze te verbeteren. Kijk hiervoor naar de uitleg die bij elke indicator wordt gegeven; wanneer scoort een organisatie een 10? Gebruik dit als richtlijn en stel een stappenplan op hoe u bij deze 10 zou kunnen komen. Kijk goed naar de beperkingen die uw organisatie heeft (tijd, geld, ruimte) en kijk wat u ondanks deze beperkingen wel kunt doen.

Voorbeeld

U scoort bijzonder laag in de categorie bedrijfscultuur. Als voorbeeld nemen we de indicator 'het tolereren van fouten door medewerkers' en hoe een score van 0 op dit gebied kan gebruiken als input voor verbetering.

U ziet onder 'úitleg' dat een score van 10 betekend; 'er wordt op een constructieve manier omgegaan met gemaakt fouten'. Fouten worden benoemd en besproken welke lessen er uit te trekken zijn. Medewerkers worden niet bestraft (zowel in financiële zin, als in respect en aanzien binnen het bedrijf.' Een score van 0 betekend dat 'fouten niet worden geaccepteerd en worden afgestraft. Soms is er zelf sprake van een angstcultuur'.

1. Bekijk de huidige situatie. Is het wenselijk dat er een angstcultuur heerst? Zo nee, ga dan verder bij;
2. Waar wilt u naartoe? Stelt u zelf een doel. Wilt u naar een score van 10, of vindt u 5 voor nu haalbaarder? Voor het voorbeeld stellen we vast dat een 7 een gewenste score is, waarbij we ons doel stellen op 'fouten worden geaccepteerd en worden gezien als opgedane kennis voor een volgende keer, deze kennis wordt verspreid door de organisatie. De medewerker wordt niet financieel gestraft'.
3. Stel vast in welke periode u resultaat wilt boeken en welke middelen uw hiervoor beschikbaar hebt (tijd, mensen, kennis, geld, ruimte). In het voorbeeld is er weinig geld beschikbaar, maar wel tijd en mankracht.
4. Welke stappen moet u nemen om uw huidige situatie te transformeren naar de gewenste situatie? Bijvoorbeeld
5. Stap 1: praat met medewerkers om de huidige stand van zaken in kaart te brengen. Wat is hun houding t.o.v. het maken van fouten, hebben ze het gevoel dat ze ervoor worden gestraft?
6. Stap 2: Gemaakt fouten worden besproken maar niet bestraft in functioneringsgesprekken en beoordeling van medewerkers. Dit wordt bekend gemaakt in de organisatie.
7. Stap 3: het hogere management draagt uit dat fouten gemaakt mogen worden, zonder fouten geen vernieuwing.
8. Stap 4: stel iemand verantwoordelijk voor de verwerking van fouten. Zorg dat kennis vergaart uit de gemaakt fout wordt verwerkt en verspreid in de organisatie.
9. Stap 5: evalueer altijd de gezette stappen. Ga zo nodig een stap terug. Vraag aan medewerkers of ze de verandering hebben ervaren, en of ze nu anders tegenover het maken van fouten staan en meer durven.
10. Stap 6: Heeft u uw doel gehaald? Zo ja, evalueer dan of dit inderdaad het gewenste effect heeft.
11. Stap 7: leer van de moeilijkheden die deze verandering met zich meebracht. Zo kunt u volgende veranderingen makkelijker doorvoeren.
12. Gefeliciteerd! U heeft een stap gezet naar een meer innovatieve en ondernemende organisatie.

Score 40 tot 70

U scoort laag tot gemiddeld op innovatief ondernemerschap. U doet al heel wat om ondernemerschap in te zetten als bron van innovatie. Bij deze score hoort een meer gedetailleerde benadering. Analyseer uw resultaat met behulp van de volgende stappen:

1. Stel uzelf een doel: welke totaal score wilt u halen? En welke scores wilt u halen in de categorieën?
2. Wat is de tijdshorizon om dit doel te halen? Welke middelen heeft u beschikbaar om het doel te verwezenlijken (geld, tijd, mensen, kennis, ruimte)?
3. Analyseer of er negatieve uitschieters zijn; op welke 10 indicatoren scoort u heet laagst en hoe komt dit?
4. Evalueer op welke indicatoren u het beste uw aandacht kunt richten om uw doel te halen.
5. Stel voor deze indicatoren een stappenplan op; welke score wilt u halen en hoe gaat u dat bereiken. Kijk voor meer uitleg van dit punt bij punt 4 van 'score 0 tot 40'.
6. Hebt u de indicatoren verbeterd? Kijk dan of u uw doel gehaald heeft.
7. Heeft het behaalde doel ook het beoogde effect gehad op de innovatie kracht van uw bedrijf? Zo ja, evalueer en communiceer dit naar uw medewerkers en netwerk. Zo niet, waarom niet, waren er grote barrières en wat ging er fout?

Score 70 tot 90

U scoort hoog op innovatief ondernemerschap. U doet al veel om innovatief en ondernemend te zijn. Wilt u nog beter worden, lees dan de volgende tips:

1. Bekijk op welke indicatoren u relatief laag scoort. Wat ligt daaraan ten grondslag en wat zou u hieraan kunnen doen?
2. Hebben de inspanningen die u verricht ook het gewenste effect?
3. Stel een doel op en wees ambitieus; waar kunt u nog meer voordeel behalen? Stel vervolgens een stappenplan op om dit doel ook te halen (zie hiervoor op punt 4 onder 'score 0 tot 40').

Score 100

Scoort u perfect? Dit kan twee redenen hebben. 1. U bent een organisatie die innovatief ondernemerschap haar hoogst mogelijk prioriteit heeft gemaakt, gefeliciteerd! Of 2. U bent wel erg optimistisch over uw bedrijf. Een score van 100 wordt eigenlijk nooit gehaald, en is ook niet per se wenselijk. Zelf bedrijven als Google en Facebook zouden geen 100 scoren. Kijk daarom nog eens kritisch naar de door u gegeven antwoorden en bekijk waar nog nieuwe vooruitgang te halen is.

Meer weten over innovatief ondernemerschap?

Wilt u meer weten over innovatief ondernemerschap, de wetenschappelijk grondslag en het onderzoek dat de basis is voor deze tool? Dan kunt u de volgende documenten opvragen bij Andrea Snijders (tel. 0617784063; email andreasnijders92@gmail.com).

Corporate Entrepreneurship in the building industry: a literature review

Literatuur studie van wetenschappelijk onderzoek op het gebied van innovatie in de bouw, Corporate Entrepreneurship en het gebruik van Corporate Entrepreneurship om innovatie in de bouw te verbeteren.

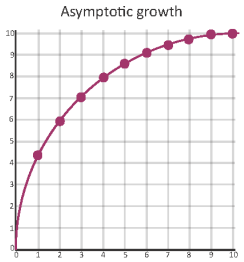
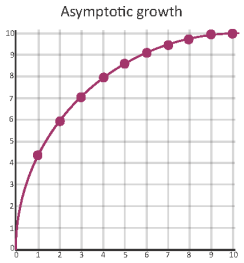
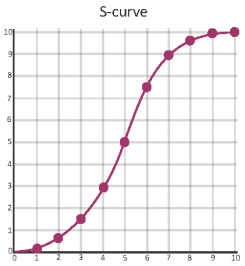
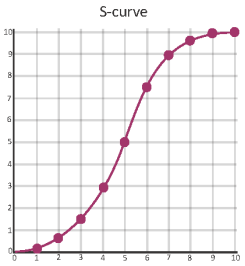
Corporate Entrepreneurship in the building industry: research on application

Studie naar de toepassing van Corporate Entrepreneurship in de bouw. Deze studie gaat in op welke factoren hierbij van belang zijn, en welke barrières er aanwezig zijn. Ook laat het zien hoe groot het effect van deze factoren is op de innovatie kracht van een bedrijf.

Corporate Entrepreneurship in the building industry - an entrepreneurship tool
Rapport over hoe de tool tot stand is gekomen, met informatie over berekeningen, met welke factoren rekening moet worden gehouden als u de tool gebruikt, en de relevantie van de tool voor Bouwend Nederland en bouwbedrijven.

Building innovation – Corporate Entrepreneurship in the building industry
Totaal afstudeerrapport over Corporate Entrepreneurship in de bouw. Beide bovenstaande artikelen staan erin, samen met een samenvatting en meer conclusies en resultaten.

Attribute effort-impact graphs and explanation

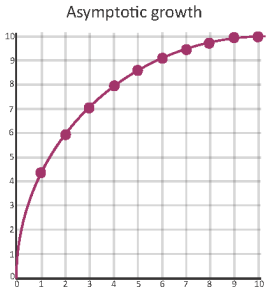
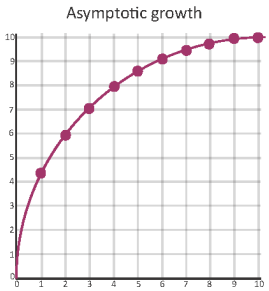
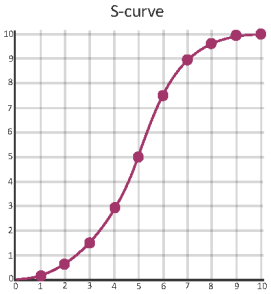
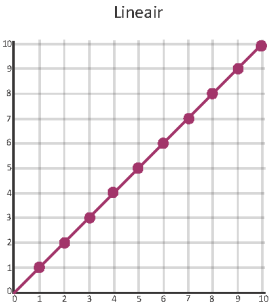
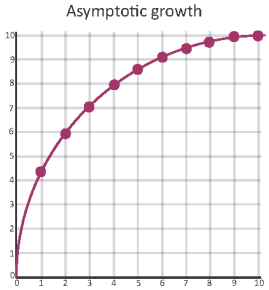
Categorie	nr	Factor	Grafiek		Uitleg
Categorie 1: het stimuleren van innovatief denken en handelen	1	De organisatie draagt middelen aan om innovatieve activiteiten van medewerkers te stimuleren.			Voor het ontwikkelen van innovatieve activiteiten is het essentieel dat er middelen beschikbaar zijn. Zonder tijd, geld, en kennis geen innovaties. Begin: een kleine bijdrage in middelen, of bijdrage in een enkel soort middel (bijvoorbeeld tijd) geeft medewerkers meteen veel meer mogelijkheden (snelle stijging) Eind: Genoeg middelen of veel middelen maken minder verschil in het opwekken van innovatieve acties. Asymptotische groei
	2	Top management support			Het Top management support is essentieel voor de ontwikkeling van innovatief ondernemerschap. Begin: Vooral om innovatief ondernemerschap op te starten is support nodig. Einde: Als het eenmaal een bepaalde aanwezigheid in de organisatie heeft, is het top management support minder belangrijk. Asymptotische groei.
	3	Ondernemer schap in de visie			Een visie is de basis voor de organisatie. Het is daarom voor innovatie van belang dat ondernemerschap hierin wordt opgenomen. Begin: Dit moet niet alleen genoemd worden (dat heeft maar een klein effect), maar ook meer toegelicht. Einde: Een heel uitgebreide visie op ondernemerschap is echter niet nodig. S curve.
	4	De organisatie stimuleert een ondernemen de houding			Deze factor is vooral belangrijk bij het opzetten van of transformeren naar een innovatief ondernemende organisatie. Begin: Dit stimuleren heeft in beperkte mate nog niet veel effect (het enkel noemen in toespraken en op posters bijvoorbeeld). Er moet hierbij een bepaalde grens worden gehaald om een gewenst effect te sorteren. Einde: een ondernemende houding alleen is nog niet genoeg voor het ontwikkelen van innovaties. De laatste stappen hierin hebben dan ook steeds minder toegevoegde waarde op dit gebied.

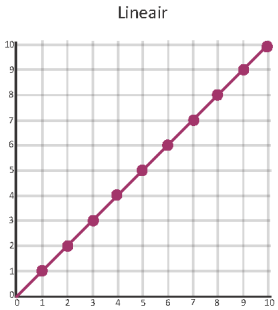
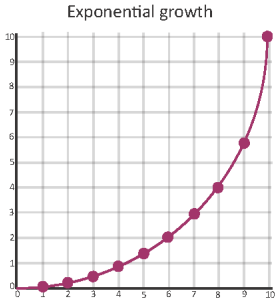
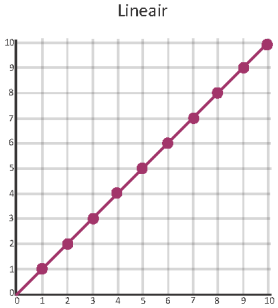
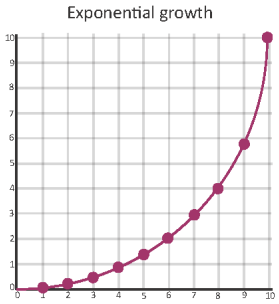
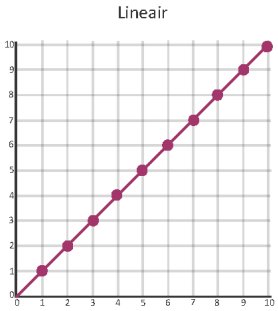
x	f(x)
1	4.5
2	6
3	7
4	8
5	8.5
6	9
7	9.3
8	9.7
9	9.9
10	10

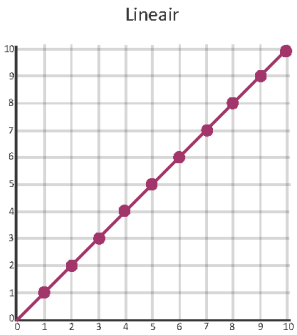
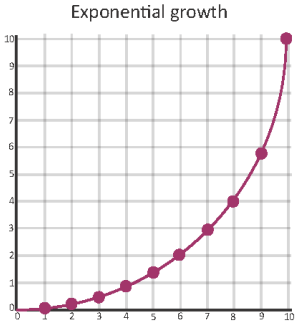
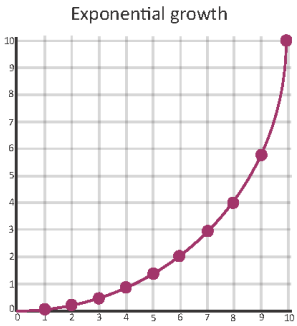
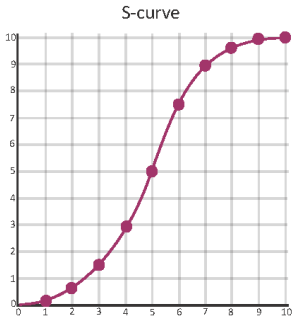
x	f(x)
1	4.5
2	6
3	7
4	8
5	8.5
6	9
7	9.3
8	9.7
9	9.9
10	10

x	f(x)
1	0.2
2	0.7
3	1.7
4	3
5	5
6	7.5
7	9
8	9.5
9	9.8
10	10

x	f(x)
1	0.2
2	0.7
3	1.7
4	3
5	5
6	7.5
7	9
8	9.5
9	9.8
10	10

					S curve.
	5	De organisatie biedt middelen aan om ondernemen de activiteiten uit te voeren		x f(x) 1 4.5 2 6 3 7 4 8 5 8.5 6 9 7 9.3 8 9.7 9 9.9 10 10	Zie uitleg bij factor 1
	6	Beoordeling van medewerkers		x f(x) 1 4.5 2 6 3 7 4 8 5 8.5 6 9 7 9.3 8 9.7 9 9.9 10 10	Begin: Medewerkers moeten vooral het gevoel hebben dat hun inzet wordt gewaardeerd, een beetje waardering heeft hierbij al een groot effect. Einde: het belang van innovatieve activiteiten voor de beoordeling van medewerkers heeft steeds minder toegevoegde waarde nadat een bepaald score is gehaald. Asymptotische groei
	7	Inspirerende voorbeelden		x f(x) 1 0.2 2 0.7 3 1.7 4 3 5 5 6 7.5 7 9 8 9.5 9 9.8 10 10	Begin: Af en toe een enkel voorbeeld zal weinig effect sorteren. Meer voorbeelden zal medewerkers het ideeën geven dat het bedrijf daadwerkelijk innovaties stimuleert. Er is hier wel een optimum in. Einde: medewerkers moeten niet te veel voorbeelden zien waardoor ze het gevoel krijgen S curve.
Categorie 2: bedrijfsstructuur	8	De organisatie is zo ingericht dat deze ruimte biedt voor innovatie		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	Hoe meer ruimte, hoe beter. Begin: Een klein beetje ruimte heeft hierbij een klein effect (huidige situatie in de bouw) Einde: veel ruimte geeft veel effect (bijvoorbeeld High Tech bedrijven, google). Een lineaire curve.
	9	De organisatie is flexibel vorm gegeven		x f(x) 1 4.5 2 6 3 7 4 8 5 8.5 6 9 7 9.3 8 9.7 9 9.9 10 10	Flexibiliteit in tijden, planning en geld geeft medewerkers ruimte. Het effect hiervan zwakt echter wel af. Begin: Geen flexibiliteit en een beetje flexibiliteit kan veel verschil maken. Einde: steeds meer flexibiliteit toevoegen heeft steeds minder toegevoegd effect op de innovatie kracht van een organisatie. Asymptotische groei

	10	De aanwezigheid van experts		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	De groei van aanwezigheid van experts is vooral van belang om een divers aanbod van kennis paraat te hebben. Hoe meer experts, hoe meer kennis. Lineaire groei.
	11	Research and Development		x f(x) 1 0.1 2 0.3 3 0.7 4 1 5 1.4 6 2 7 4 8 8 9 5.8 10 10	Begin: Een beetje geld is vaak niet genoeg om onderzoek echt op te starten en te kunnen blijven financieren. Einde: veel geld in R&D heeft groot effect, andere sectoren laten dit zien. Exponentiele groei.
	12	Leven lang leren		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	Begin: Als medewerkers op de hoogte zijn van moderne inzichten, technieken en theorieën neemt de innovatiekracht van een bedrijf toe. Einde Hoe meer medewerkers meer kennis hebben, hoe beter. Lineair patroon.
Categorie 3: bedrijfscultuur	13	Het tolereren van fouten door medewerkers		x f(x) 1 0.1 2 0.3 3 0.7 4 1 5 1.4 6 2 7 4 8 8 9 5.8 10 10	Zonder fouten geen nieuwe ideeën. Daarom is het van groot belang om fouten te tolereren en op een constructieve manier mee om te gaan. Dit werkt vooral goed als het maken van fouten in hoge mate wordt geaccepteerd. Begin: fouten worden niet afgestraft Einde: fouten worden gebruikt om verbeteringen aan te brengen. Een exponentiele groei.
	14	Conflicten tussen medewerkers		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	Hoe beter conflicten worden opgelost, hoe beter het resultaat. Begin: conflict wordt geaccepteerd. Eind: een constructieve omgang met conflict brengt betere oplossingen in beeld. Lineaire groei.

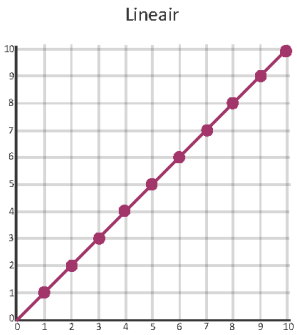
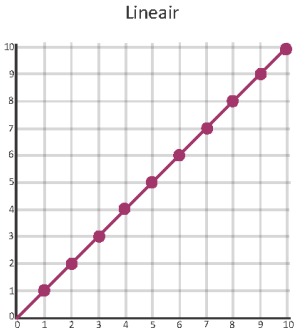
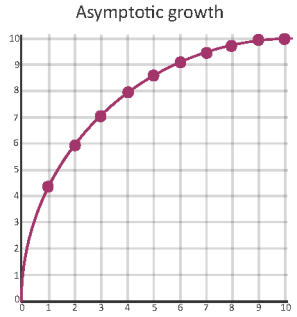
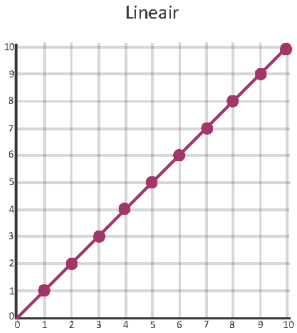
15	De houding van de organisatie t.o.v. medewerkers die kritisch kijken naar de status quo/ gebruikelijke gang van zaken, binnen de organisatie			Begin: Dit heeft een direct effect. Wanneer medewerkers kritisch mogen zijn, zien ze nieuwe kansen en mogelijkheden. Einde: de kritieke houding omzetten in acties is pas mogelijk als deze factor in hogere mate aanwezig is. Lineaire groei.
16	Een ondernemende houding en het uitvoeren van ondernemende activiteiten maakt deel uit van de organisatiecultuur			Begin: het duurt even voordat medewerkers zo ondernemend zijn, dat het ook omgezet wordt in actie. Einde: hoe ondernemender de organisatiecultuur, hoe meer medewerkers innovatieve activiteiten uitvoeren. Exponentiele groei.
17	De houding van medewerkers t.o.v. ondernemende activiteiten			Begin: als medewerkers hier een beetje positief tegenover staan, zal dat nog niet leiden tot actie. Einde: als ze er echter erg positief tegenover staan, zal dit leiden tot ondernemende activiteiten. Exponentiele groei.
18	Medewerkers worden gestimuleerd om risico's te nemen als het gaat om het ontwikkelen van nieuwe ideeën			Risico's nemen is essentieel in het ontwikkelen van innovatieve ideeën. Een organisatie moet dit accepteren, stimuleren en faciliteren. Begin: in kleine mate heeft dit nog weinig effect op innovatie in een bedrijf. Dit neemt echter wel snel toe, zodra het nemen van risico's niet meer wordt afgestraft. Einde: verminderde toegevoegde waarde als stimuleren van risico's constructief wordt benaderd. S curve

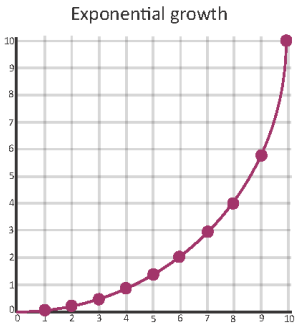
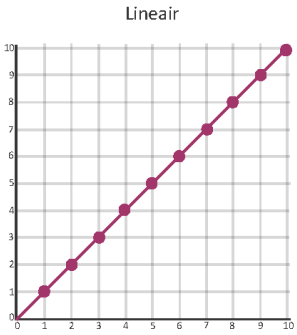
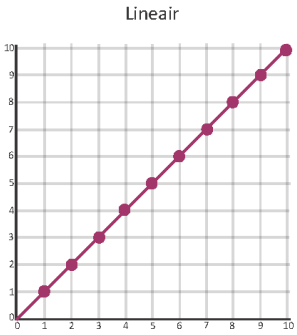
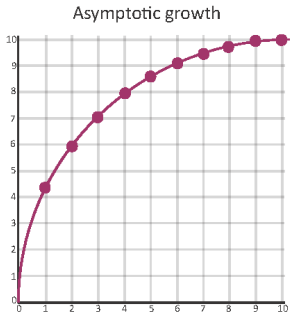
x	f(x)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

x	f(x)
1	0.1
2	0.3
3	0.7
4	1
5	1.4
6	2
7	4
8	8
9	5.8
10	10

x	f(x)
1	0.1
2	0.3
3	0.7
4	1
5	1.4
6	2
7	4
8	8
9	5.8
10	10

x	f(x)
1	0.2
2	0.7
3	1.7
4	3
5	5
6	7.5
7	9
8	9.5
9	9.8
10	10

	19	Contact stimuleren		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	Begin: voor contact tussen verschillende groepen geldt; hoe meer hoe beter. Einde: een actief beleid hierin draagt bij aan de innovatiekracht van het bedrijf. Een lineair verband.
Categorie 4: omgaan met projecten	20	Het bedrijf gebruikt projecten om innovaties te testen en te implementeren en		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	Dit is zeker belangrijk. Als dit op grotere schaal gebeurt, zal het ook een grotere impact hebben. Begin: enkele projecten dienen als pilot. Enkele innovaties kunnen zo getest worden. Einde: alle projecten worden (waar mogelijk) ingezet als proeftuin voor nieuwe ideeën. Hierdoor komen meer innovaties tot uitvoering. Een lineair verband.
	21	In het selecteren van projecten wordt rekening gehouden met de potentiele kansen die het project biedt op gebied van innovatie en vernieuwing		x f(x) 1 4.5 2 6 3 7 4 8 5 8.5 6 9 7 9.3 8 9.7 9 9.9 10 10	Begin: Dit heeft al direct een effect. Door alleen al het aspect innovatie mee te nemen in een aanbestedingstraject, creëer je ruimte. Einde: steeds meer ruimte heeft een verminderde toegevoegde waarde. Asymptotische groei.
	22	Business Cases (voor- en nadelen van een project, projectrisico's) worden ontwikkeld en de projectinrichting wordt hierop gebaseerd.		x f(x) 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10	Hoe meer de projectinrichting rekening houdt met van te voren gesignaleerde mogelijkheden, hoe soepeler het project zal lopen, en dus hoe meer ruimte en kansen er zijn voor innovatie. Lineair verband.

	23	Ruimte voor innovatie in de projectplanning.			Begin: Een klein beetje ruimte kan al verschil maken. Einde: er is een bepaalde hoeveelheid tijd nodig om innovaties ook daadwerkelijk te kunnen door ontwikkelen en gebruiken. Exponentiele groei.
Categorie 5: overig	24	Het vergaren van kennis over trends en gebeurteniss en in de omgeving van de organisatie			Hoe meer inzicht een bedrijf heeft in zijn omgeving, hoe beter het kan inspelen op nieuwe ontwikkelingen en trends. Een lineaire verband.
	25	Het bedrijf onderhoud contacten in zijn netwerk			Het onderhouden van contacten geeft inzicht in klantvraag, nieuwe ontwikkelingen bij leveranciers, en de concurrentie. Hoe meer kennis hierover beschikbaar is, hoe meer ideeën eruit voort kunnen komen. Een lineair verband.
	26	Het meten van innovatie			Het meten van innovaties op verschillende benchmarks is essentieel om hun impact en succes te kunnen bepalen. Begin: Hoe nauwkeuriger dit gebeurt, hoe beter. Er is hier echter wel sprake van een 80/20 regel; een beetje meten geeft al veel inzicht Einde: terwijl een steeds gedetailleerde meting niet heel veel meer extra bied. Asymptotische groei.

x	f(x)
1	0.1
2	0.3
3	0.7
4	1
5	1.4
6	2
7	4
8	8
9	5.8
10	10

x	f(x)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

x	f(x)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

x	f(x)
1	4.5
2	6
3	7
4	8
5	8.5
6	9
7	9.3
8	9.7
9	9.9
10	10

Appendix Q Recommendations for future actions

In extent to the recommendations given in chapter 4.5, this appendix gives recommendations for future actions on all the validated attributes from the FDM study.

For the increase of innovation the recommendation for future actions are:

1. *Ensure top management support* – Make sure you top management in on board. Top managers should express the importance of innovative entrepreneurship, and should also perform this behavior themselves. Top management support is essential when implementing changes in the organization.

2. *Provide resources to members*– The road to an innovative and entrepreneurial organization is paved with resources. Money, time, knowledge, space etc., are all required in order to create an environment where members can be entrepreneurial. Reserve these resources and communicate their availability.

3. *Create an entrepreneurial organization culture* – The organizational culture should incorporate an entrepreneurial attitude and activities. This is essential in the implementation of Corporate Entrepreneurship.

4. *Use projects as vehicles for innovation* – Use projects to test and implement innovation.

5. *Perform intense scanning activities* – Look at the world outside of the organization. The more knowledge you have of the environment and surroundings of your business, the more entrepreneurial opportunities and innovative ideas will occur.

6. *Encourage members to act entrepreneurial*– The organization actively encourages its members to employ entrepreneurial thinking and entrepreneurial behavior.

7. *Stimulate contact between different member groups* – The organization supports contact between members of different function groups, experience levels, and age groups. This is structured, for example in monthly brainstorm sessions.

8. *Accept mistakes from members* – The organization accepts mistakes from members that are made in the pursuit of innovation through entrepreneurship. The organization accepts mistakes as an essential part of the innovation process.

9. *Facilitate constant education* – The organization has to stimulate members to become reflective practitioners. A constant education should be an integral part of the function description of all members.

10. *Make entrepreneurial activities attractive* – Make entrepreneurial activities attractive to members with an entrepreneurial nature. For example for rewarding their entrepreneurial actions and by providing resources to perform entrepreneurial activities.

11. *An organizational structure that create room for innovation* – The organizational structure is a supporter for innovative behavior. It should not be completely defined, and leave room for employing innovative activities.

12. *Stimulate a critical attitude towards the status quo*– Members have to be stimulated and facilitated in the creation of a critical attitude towards the standard way things go in the organization. The organizations should question members in order to find their suggestions for improvement on the status quo.

13. *Maintain contact with organizational network* – An active approach towards other members of the organizational environment; contact with customers, users, suppliers etc.

14. *Employ a reward system that encourages the right incentives* – The organizational reward system should encourage desirable entrepreneurial behavior. For example by financial rewards for innovative ideas, or increase in status for people who act entrepreneurial.

15. *Draw attention to inspiring examples* – The organization should distribute inspiring innovation examples amongst its members in order to inspire them to be innovative themselves.

16. *A flexible organizational structure* - The organizational structure has to be adaptable to changing circumstances and new opportunities. When new ideas arise, the organizational structure needs to have to flexibility to follow these new ideas.

17. *The client creates room for innovation* – By tendering procedures that incorporate the importance of innovation, building organizations get an incentive to act as innovative as they can.

18. *Make innovation measurable* - Benchmarking innovations will make it possible to evaluate their performance on several levels and thus to determine whether employing and developing that is worth the resources that are needed to do so.

19. *Perform Research and Development activities* – Performance of R&D activities will lead to an increase in innovative ideas and developments.

20. *Select projects that have great innovative potential* – In creating the project portfolio, the organization should take the innovative potential of the project into consideration. When the organization does this, it will have create more room for innovations to be tested and implemented.

21. *Make experts available* – Experts on innovation and entrepreneurship are made available to members throughout the organization.

22. *Stimulate risk taking*– The organization should acknowledge the existing relationship between innovation and risk taking. On cannot be without the other. When members are allowed to take risk, they will create more innovative ideas.

23. *Integrate the value chain* – Integration in the value chain will lead to more knowledge communication between different members of the building industry. More knowledge about the industry will lead to more opportunities spotted.

24. *Entrepreneurship is an integral part of the organizational vision* – The vision of the organization depicts its desired state. This should include its vision on entrepreneurial behavior of members.

25. *The project planning incorporate time for innovative activities* – Instead of making project planning with solely traditional activities, there should be time to reflect and come up with new ideas to improve the project.

26. *Create Business Cases* – A Business Case will help to establish the pros and cons of a project and the project risks. This insight will help in the creation of a better project and will provide input for opportunities for innovation in the project.

27. *Accept conflict between members* – And handle is constructively. This results is an organizational culture that fosters transparency and openness. This will lead to an environment in which people are more likely to share ideas and opportunities without the fear of conflict.

In regard to the barriers of innovation the following recommendations are given:

1. *Change the standard contract form* – the current traditional contract that are prescribed by law and habit should no longer be the standard choice when making a tender. Use more modern concepts, such as tendering based on ENVI and integral contract as DBFMO.

2. *Create a more continuous nature* - The fragmented nature of the building industry is a high ranking barrier. This attribute is an addition to the previous recommendation. Integral contract forms will diminish the fragmented nature of the industry, enhance trust, and decrease loss of knowledge.

3. *Convey the necessity for an innovation drive* – Perhaps it is time for the building industry to wake up and realize that without innovation, there is no bright future for traditional organizations. Innovation should be a core concern of building firm in order to stay competitive and relevant.

4. *Modernization of laws and regulations* – laws and regulations should be updated to modern standard. Less complex regulation will lead to more room for innovation in tendering, project execution, and project result.

5. *A reward system that gives the right incentives* – the current reward system that organizations employ are not rewarding the right actions. Creativity, quality of work, and innovative performance should be a part of the standard reward system in order to boost innovation.