Organizational Behavior in Construction Projects:

Understanding the Effect of a Coalition

Master Thesis | Xander Zonneveld | May 2018

*"***If I had asked people what they wanted, they would have said faster horses***."***

Saying concerning innovation

"*Meten is weten*"

Dutch saying

COLOPHON

Author

Name	X.R. (Xander) Zonneveld
Student number	4159640
E-mail	x.zonneveld@gmail.com
Master program	Construction, Management, and Engineering
University	Delft University of Technology

Graduation Committee

Chairman
Prof. Dr. H.L.M. Bakker
Faculty of Civil Engineering & Geosciences
Section: Integral Design & Management

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Dr. Ir. M.G.C. Bosch-Rekveldt
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Section: Integral Design & Management

Second Commissioner
Dr. Ir. R.M. Stikkelman
Faculty of Technology, Policy & Management
Section: Engineering, Systems & Services, Energy & Industry

External Supervisors

Company supervisor
Ir. J.M. Eykelenboom MBA
Project Director at Fluor B.V.

Company supervisor
Ing. J. Buffing
Project Engineer at Fluor B.V.

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PREFACE

Imagine you own one of the first cars ever made. It is a basic car with an engine, a steering wheel, a driving mechanism, and you are the driver. You turn the key, the car starts roaring and moving, and you are on your way. But at some point you blow up the engine because it became too hot. You had no idea, no information, how could you have known. Over time, people developed instruments to give you feedback and help you understand the car. Now, your dashboard indicates if the engine temperature is too high. You can act accordingly and stop the car.

Now, imagine you are the manager of a construction project. It is a simple project with a construction craft, a design, and construction tools. You start managing the project and at some point encounter severe time delays and cost overruns because of malfunctioning craft. But you had no idea at all, how could you have known…

With great pleasure, I worked on the report which lies in front of you. It is the product of a 6 month study to understand organizational behavior in construction projects. People are the most valuable asset in a construction project: they are the 'engine' of the project. Let this report inspire scholars and people in the industry

During this graduation internship, multiple people have been involved and contributed to this research and my personal development. Once more, I would like to show my gratitude to the following people. A special thanks to Marco Eykelenboom for the opportunity to conduct this research. Your everlasting enthusiasm motivated me from the very first moment. Our vivid discussions were very interesting and inspiring. After such sessions, I always walked away with a big smile on my face realizing that I learnt new things. Also, I would like to thank Joeri Buffing for your practical tips and your abstract view on the research progress.

Special thanks to my graduation committee members who supervised my graduation process. Marian Bosch-Rekveldt, thank you for the substantive support. You were always available to meet and quickly understood the challenges I was facing. Your support had an important share in the realization of this report. Hans Bakker, for the critical view during the meetings and your personal advice. I remember walking out of your room after the kick-off meeting and you padded my shoulder while saying "don't despair". I did not and enjoyed the ride. Rob Stikkelman, for the questions to put the research in a different perspective. Our first meeting helped me understanding the petrochemical industry and its practices.

Big thanks go to my fellow room members Manon, Ferry, and Richard at the construction site. Our daily conversations brought a lot of fun. Thanks Frank, for the graduation competition and productive back to back sessions. My roommates at home, nothing beats graduating! At last, I would thank my parents for giving me all the opportunities to fully develop myself. *Alea iacta est.*

Xander Zonneveld

Delft – May 30, 2018

EXECUTIVE SUMMARY

The construction industry gets increasingly aware of the importance and value of people. Considering the nature of construction projects a certain level of collaboration is needed to successfully deliver a project. Throughout the complete project life cycle of large engineering projects, multiple actors are involved. As in any other industry and if not more, it is crucial to understand how people work and collaborate. Collaboration is positively associated with project performance.

This research is conducted, from a managing contractor perspective, to study the formation of a coalition in the construction phase of a large engineering project. The coalition consists of the client, the managing contractor, and subcontractors. The coalition members are critical in finishing the project. The project management intervention is implemented to increase collaboration between coalition members. It should lead to increased organizational effectiveness. However, it remains unclear what the effect of a coalition is. Moreover, it is unclear how people, groups, and the project organization are affected by this intervention. This research is guided by the following question:

Research question: What is the effect of a coalition during the construction phase?

The objective of this research is to determine the effect of a coalition through understanding organizational behavior of a coalition during the construction phase. To efficiently and effectively stimulate collaboration amongst people, behavioral change is needed. Changing organizational behavior can be an instrument for project manager to steer for organizational effectiveness. Within a project organization, it is highly relevant for managers to understand the principles of behavior and behavioral change. People need to act differently than they are used to. Organizational behavior is determined by the individual, group, and organization. This research focusses on the coalition members and the project organization. Organizational behavior covers a broad spectrum of aspects. However, not all aspects are relevant in this research.

Research Design

This research can be defined as action research which is conducted at one large engineering project. After extensive literature study, a theoretical framework is developed which is the starting point for the empirical study. The empirical study consists of both a qualitative and a quantitative study. The qualitative data is obtained by the documentation analysis, unstructured interviews, and the theoretical study. The qualitative study focusses on the coalition, its sub-interventions, and the organizational context. Two quantitative studies are conducted. First, the Organizational Behavior Survey, developed in this research, is used to measure the attitudes of all project members weekly. In total, 1622 people responded to the survey between week 50 – 2017 and week 11 – week 2018. In the same period, 597 suggestions for improvement were given. The obtained data is repeated cross-sectional survey data. The reliability of the statistical model, developed using the Organizational Behavior Survey data, is good (Cronbach's $\alpha = 0.748$). The model measures three underlying constructs: reflection on project (Cronbach's $\alpha = 0.794$), collaborative attitude (Cronbach's $\alpha = 0.627$), and miscellaneous (Cronbach's $\alpha = 0.337$). The latter construct hardly measures an underlying construct and therefor these items will be interpreted separately in subsequent analyses. Second, a Gallup survey is conducted amongst the client and managing contractor in October 2017 (N=127) and January 2018 (N=117). The Gallup survey data helps interpreting the results of the Organizational Behavior Survey of the client and managing contractor.

Coalition Formation

The introduced coalition intervention consists of seven sub-interventions which give input to change organizational behavior on three levels. On individual level, the intervention might affect the values concerning collaboration of project employees. Moreover, a new construction manager makes the project team more diverse. On group level, the group roles and team responsibilities changed due to the coalition formation. The coalition members need to become the promotors of the coalition within their own company. In addition, the coalition members have new responsibilities each other; the client, managing contractor, and subcontractors. On organizational level, the introduction of the coalition changes the governance structure of the project organization. The traditional hierarchical project structure changes to a network based structure. Also, the contractual structure changed due to the formation of the coalition. The reimbursable contract between the client and managing contractor and the lump-sum and unit/rate contracts between the managing contractor and subcontractors are still in place. As part of the coalition formation, an incentive to finish the project earlier is added for all coalition members. The subcontractors are de-risked for extra expenses due to the coalition formation. The contractual changes can be seen as a shift towards relational contracting.

Organizational Behavior Survey Results

Statistical analyses of the Organizational Behavior Survey data resulted in findings on four areas:

Attitude towards organizational behavior aspects. There are significant differences in the attitude towards organizational behavior between coalition members. Coalition members strongly differ in attitude regarding communication & leadership, group cohesion, perception, emotion, and trust. Communication & leadership are the behavioral aspects which show the most significant differences between companies. This is supported by the finding that 264 of the 597 suggestions for improvement concern communication and leadership. Coalition members hardly differ in attitude regarding stress, motivation, perception & group functioning, and changing way of working.

Relationship between coalition members. The analysis of the relation between coalition members, led to three findings. First, the attitudes of both the client and managing contractor hardly differ. Possibly, this is caused by similar cultural background and collaboration since the beginning of the project. Second, the relation between the client and subcontractors is strengthened. The culture of the coalition member might explain differences and similarities between the client and subcontractors. Third, the attitudes of the managing contractor and the subcontractors differ. The differences and similarities can be again attributed to the cultural background of the coalition members.

Experience. There are significant differences in attitude between employees with different experience. On average experienced employees are more motivated by rewards than employees with little experience ($r = 0.272$). Also, unexperienced employees feel less part of a project team but see others less as competitors than experienced employees. Moreover, unexperienced employees are less positive about the project and find the communication poorer.

Trends. Focusing on the attitude of the coalition members collectively, three trends were observed during the coalition:

1. In general, the coalition members became more positive about the project during the coalition. The aspects communication and leadership showed the steepest positive increase. In addition, coalition members were more satisfied about their task performance. Also, they felt more part of one team and became in general more positive about the project.

2. During the coalition, the coalition members showed less trust in completing the project in time and enjoyed working together with other companies less. Moreover, the enjoyment of doing the job decreased over time.
3. No significant differences were measured in synergy, attitude towards changing way of working, stress, external motivation, and seeing others as competitors during the coalition.

The Gallup survey showed that the client's and managing contractors' satisfaction increased since the introduction of the coalition. This indicates that the coalition in general increases satisfaction.

Research question: What is the effect of a coalition during the construction phase?

Conclusion

The coalition has an effect on the coalition members and the project organization. The coalition changes the contractual and organizational structure. The contractual structure of the coalition changes can be seen as relational contracting. Adding an incentive to the current contracts stimulates involved actors to increase collaboration. The traditional hierarchical structure of client, managing contractor, and sub-contractors changes towards a network structure. New relations between the involved actors are created which can stimulate communication between them. The coalition introduces a dynamic structure where members can increase collaboration.

In this research, a survey is developed to measure the attitude of people working on the project weekly. This survey can be seen as part of a dashboard. Project managers are able to track the attitude towards selected organizational behavior aspects of its employees. This information gives new input for the decision-making process of a manager. Furthermore, measuring the workforce's attitude changes traditional project management and the way project objectives can be set.

The coalition is associated with changes in attitude of coalition members and with four drivers which influence coalition member's attitude: contractual structure, governance structure, culture, communication and leadership**.** The coalition improves both the collaboration and communication between coalition members. The general perception of the client becomes more positive due to the intervention. However, the client showed a decrease in emotion and attitude towards group functioning. The managing contractor seems to be unaffected by the coalition interventions. Subcontractors react diverse on the coalition intervention but their attitude towards communication and leadership improved. But there is room for improvement. In general, the attitudes of the coalition members seem to be driven by their cultural background.

Recommendations

This research led to multiple possible new research directions. First, conduct additional research at another construction project to compare the effects of a coalition. Second, the retrieved data can be used for Structural Equation Modeling to get more insight in the causation of the effects. Third, conduct an in-depth research focusing on one behavioral aspect. Fourth, the validity of Organizational Behavior Survey can be improved.

In addition, four recommendations are provided for managing contractors. First, managing contractors should start measuring organizational behavior in current and future projects. Second, improve the practical implementation of the survey. Third, the managing contractor should make use of the full potential of the obtained data set. Fourth, form the coalition again, start coalition earlier in the project life cycle, and keep employees satisfied after the coalition formation.

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Acronyms

CL	Client
EPC	Engineering, Procurement, and Construction phase
EMRE	ExxonMobil Research and Engineering
GQ	Gallup Question
HSE	Health, Safety, and Environment Department
MC	Managing contractor
RAHC	Rotterdam Advanced Hydrocracker
SC	Subcontractor
SEM	Structural Equation Modelling
SM	Safety Mature
SS	Short Service

1 INTRODUCTION

This chapter introduces the research conducted for Fluor Corporation. In section 1.1, Fluor, the RAHC project, former research, the project organization, and the coalition intervention are described. Section 1.2 elaborates on the need for interventions during the construction phase. In section 1.3, the relevance of people in the construction industry is explained. Next in section 1.4, the relevance of studying organizational effectiveness is elaborated. The problem statement which is the reason of this research is described in section 1.5.

1.1 Fluor Corporation

This research is conducted for Fluor Corporation (abbreviated as Fluor). Fluor is an engineering and construction company which operates worldwide in a variety of industries: petrochemical, process, infrastructure, government and power. Its services consist of engineering, procurement, construction, maintenance, and project management. One of its subsidiaries, Fluor Netherlands, is working on the Rotterdam Advanced Hydrocracker (RAHC) at the ESSO refinery at Botlek, Rotterdam. This research is conducted at the RAHC project.

1.2 Rotterdam Advanced Hydrocracker

ESSO requested ExxonMobil Research and Engineering (EMRE) to execute an expansion of the refinery. The RAHC project expands the hydrocracker unit to upgrade heavier byproducts into cleaner, higher-value finished products such as base stocks and ultra-low sulfur diesel. EMRE on their behalf outsourced the engineering, design, procurement, and construction of the advanced hydrocracker ('the project') to Fluor. Fluor has a budget of approximately 1.5 billion USD and relies on multiple subcontractors during this project. More than 1500 people are working on the project during peak times. The timeline of the project is given in Figure 1. Logically, Fluor has the ambition to deliver a successful project: the RAHC project should be delivered within time, at least cost neutral, and with satisfied actors. This ambition is captured in the used motto: *'together we will make this the best project ever!'*. According to Fluor, collaboration with all relevant stakeholders is crucial to successfully execute and deliver this project. This is endorsed by Bakker and De Kleijn (2014), as they point out that successful projects require an effective organization with focus on how people organize themselves and collaborate.

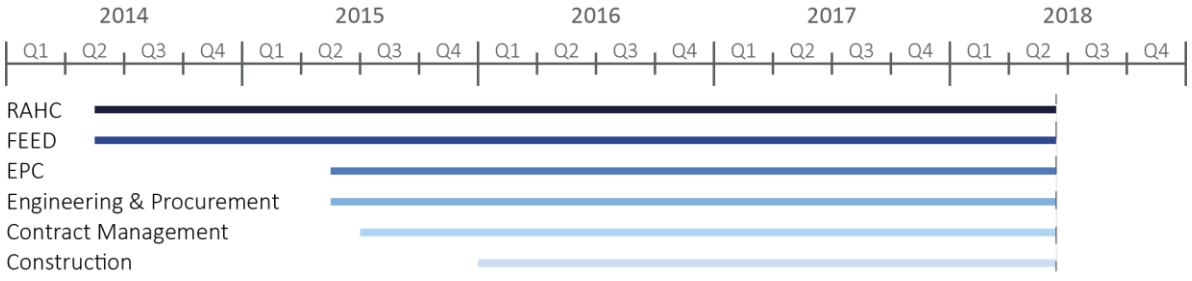


Figure 1 Project Timeline

1.2.1 Former Research

Fluor works together with the Delft University of Technology (TU Delft) to research the concept of organizational effectiveness. Previous research has been conducted on collaboration in the front-end engineering design (FEED) phase (Wang, 2015), impact of concurrent engineering on organizational effectiveness in the phases prior to the construction phase (Patil, 2016), and improvement opportunities in the collaboration between general contractors (Eggermont, 2017). These researches also contribute to the ambition to deliver the best project ever!

1.2.2 Project Organization

The client, EMRE, appointed Fluor as main contractor. Fluor on their behalf outsourced multiple activities to different subcontractors. Outsourcing reduces the risks of the main contractor as they do not take care of all activities on their own (Quinn, 1999). On site, multiple companies work next to each other and need to collaborate at the same time. It is important to take relationships between actors into account because after projects, what sticks in the mind of the actors are the memories of others and impressions of harmony, goodwill, and trust (Ward, Curtis, & Chapman, 1991).

The Fluor management acknowledges the importance of collaboration practices and tends to shift from a traditional approach of command and control towards a trust-based collaboration between stakeholders. The Fluor management decided to intervene in the organizational structure in September 2017. They decided to form a coalition with six relevant stakeholders. The selection of subcontractors is based on their criticality. If the subcontractors still needed to start or complete a relatively large amount of work, they were invited at the table. A coalition is defined as: "*a temporary alliance of distinct parties, persons, or states for joint action"* (Merriam-Webster, 2017). Joint action is characterized by a common goal. The shared objective should be the fundamental reason to collaborate. However, stakeholders act according their interest. The interests can differ which could lead to misalignment.

1.2.3 Coalition Forming Process

The Fluor management continuously tracks the progress of the RAHC project using probabilistic models. Fluor forecasts the progress to make appropriate managerial decisions. The actual consolidated progress (per month) remains below the forecasted consolidated progress. Both the schedule and cost forecast are not in line with the desired outcome. Therefore, the management team has to make a decision based on today's knowledge and execution pace to overcome the current deadlock. Three options are possible in this situation. Each option will increase the cost of the project.

1. The progress remains the same and the final date needs to be delayed
2. The progress increases and the reference date will be made
3. A combination of increasing the progress and delaying the final date

Fluor's management communicated the forecast to the client and decided to intervene by setting up the coalition. Without any interventions the project will not be delivered in time, cost neutral, and satisfy stakeholders. According to the management team, the relevant stakeholders understood the need for an intervention. An intervention can speed up the process, save money, and satisfy stakeholders. Nevertheless, an intervention can also slow the project down and cost more money, which leads to more dissatisfaction.

It remains unclear for Fluor if the coalition intervention is valuable. The perceived potential benefits of the intervention should outweigh the status quo and related risks. It is not (yet) possible to gain insight in the outcome and effectiveness of the coalition. The objective of the coalition is to accelerate the remaining construction process through increased levels of collaboration. Moreover, this coalition should generate other value through increased levels of collaboration.

The objective of the Fluor management team is to gain insight in the value of forming a coalition during the construction phase, and measuring the outcome and effectiveness of the coalition. In the next section 1.2, relevant scientific literature is discussed. The knowledge deriving from the literature study can be of use for ongoing and future construction projects (Wiewiora, Murphy, & Trigunarsyah, 2010).

1.3 The Need for Interventions during the Construction Phase

Large construction projects take on average 20% longer to finish and have an 80% cost overrun (Changali, Mohammad, & Van Nieuwland, 2015). Whereas, 98 percent of the mega construction projects (defined as project over 1 billion USD) encounter cost overruns of more than 30 percent. In addition, 77 percent of the projects are at least 40 percent late (Agarwal, Chandrasekaran, & Sridhar, 2016). In the construction industry, project failure regarding time delays and cost overruns is widely acknowledged and has been researched extensively by academics (Bertelsen, 2003; Flyvbjerg, Bruzelius, & Rothengatter, 2003; Morris & Hough, 1987). Better project management can improve the chances of success.

There is a limited time to ensure the success due to the finite life cycle of a project. A typical project life cycle consists of four stages: concept, development, execution, and transfer. Construction is part of the execution phase. The project manager has influence on all stages. But, the level of influence diminishes over time: managerial decisions have relatively less impact on the project in later stages. Parallel, the implementation costs of the measures will increase over time (Figure 2). The level of influence during the constructing phase is limited because most of the contracts are already in place.

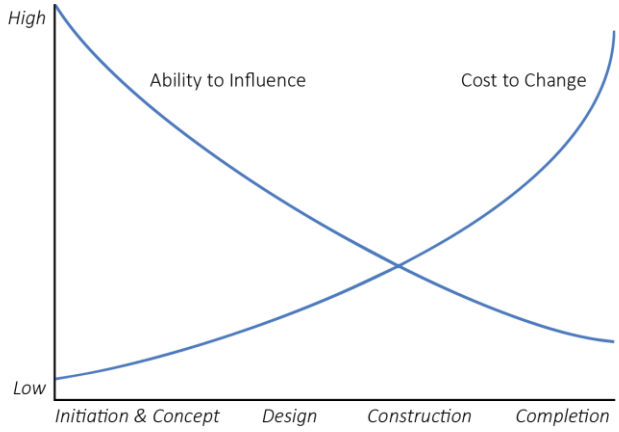


Figure 2 Project Cost Reduction Opportunity – based on (Australian Constructors Association, 1999)

1.3.1 Project Life Cycle

The RAHC project followed a refinery execution sequence developed by Fluor (Table 1) (Patil, 2016). This list gives an overview of the sequence but multiple iterations and changes are made during the execution. In 'traditional' procurement projects, the main contractor and subcontractors pursue their self-interests to such an extent that collaborative working is impossible to obtain (Akintan & Morledge, 2013). Procurement methods used by the client heavily influence subcontractor involvement and value creation (Eriksson, Dickinson, & Khalfan, 2007). Clients and particularly main contractors are unaware of the added value subcontractors can bring to the table when they are integrated in important decision-making processes (Dainty, Briscoe, & Millett, 2001). By setting up the coalition subcontractors are invited at the negotiation table.

Table 1 Project Activity List – based on (Patil, 2016)

#	Activity
1	**FEED**
2	**EPC Phase**
3	**Engineering – Procurement (EP)**
4	P&ID's IFD
5	HAZOP review
6	Plot plan IFD
7	30% (3D model review)
8	Plot plan IFC
9	Confirmed vendor data
10	60% (3D model review)
11	P&ID's IFC
12	90% (3D model review)
13	Piping ISO IFC
14	**Contract Management**
15	Bidders Pre-qualification
16	RFP package issue to bidders
17	Commercial and technical evaluation / Award recommendation
18	Award
19	Mobilization
20	**Construction**
21	Civil work
22	Equipment placing and installations
23	Piping / Mechanical work
24	Electrical + Instrumentation work
25	Pre-Commissioning and Turnover
26	Mechanical completion

1.4 The Relevance of People in the Construction Industry

Throughout the complete project life cycle, people are involved: directors, managers, professionals, and technicians. Managers play a pivotal role to improve the chances of success. Their main responsibility is to make decisions, allocate resources, and direct the activities of others to reach certain objectives. Managers get things done through other people, who on their behalf decide what happens during a project. As in any other industry, it is crucial to understand how people work in the construction industry. Amongst professionals in the industry and academics, the importance of people and the need to increase collaboration is widely acknowledged. Groak (2002) showed that the focus from construction firms on economic activities shifted towards the notion of an industry based on the collaboration of multiple stakeholders. Groak (2002) asserted that future research of construction projects should embrace the 'ad hoc' nature of the temporary construction teams. This led to the emergence of new team working approaches such as the networked organization, project alliancing, relational contracting, and integrated project delivery.

The industry is characterized by multiple companies collaborating and therefore the network theory is an appealing theory for the research of construction project organizations (Pryke, 2004). Networked organizations, a group of independent organizations which voluntary work together for a common purpose, incorporate the network theory. The theory can be seen as the counterpart of the principal-agent problem; the dependency of the principal on the agent which undertakes a task on behalf of the principal (Müller &

Turner, 2005). This leads to asymmetry in information provision which possibly results in interpersonal issues and interest misalignment.

The network theory challenges the conventional ideas of power and control. The principles of the network theory are used to develop the integrated project delivery (American Institute of Architects California Council, 2007). Integrated project delivery is different from traditional project delivery because it requires extra emphasis on the social aspects throughout the project lifecycle (Chinowsky & Songer, 2011). Traditional project delivery makes use of fragmented, 'just-as-needed', and hierarchical teams who follow linear and segregated processes. The traditional agreements encourage unilateral effort where risks are individually managed and transferred to the greatest extent possible. Compensation is individually pursued. The integrated project delivery approach emphasizes the need for integrated project teams that are assembled in an early stage. Processes are concurrent and multi-level. Both risk and rewards are collectively managed and shared. The agreements between parties encourage multi-lateral open sharing and collaboration. Trust, communication, and openness are key values of this approach.

Considering the nature of construction projects a certain level of collaboration is needed to successfully deliver the project. Bakker and De Kleijn (2014) stated that managing engineering projects is all about people: *people are key*. Understanding how people work in organizations is of great importance to create effective organizations. Especially, in the construction industry where collaboration between people is required to succeed.

1.4.1 The Relevance of Collaboration

The above mentioned organizational approaches embrace the importance of collaboration. Yet, the collaboration between actors still can be improved. There is no universal definition of the concept *collaboration* (Li, Cheng, & Love, 2000). However, in most researches the definition of The Construction Industry Institute (1991) is used:

"*A long-term commitment by two or more organizations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organization boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost-effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services."* (Construction Industry Institute, 1991, p. iv).

Collaboration has multiple related definitions: *association, collusion, combination, concert, participation, partnership, teamwork, alliance, fraternization, joint effort,* and *working together*.

Multiple academics researched the value of collaborative practices on construction projects. The first researches focused on the concept '*team'* (Bennett & Jayes, 1995; Latham, 1994). More recent, case studies in Hong Kong (Chan, Chan, & Ho, 2003), Sweden (P. E. Eriksson & Nilsson, 2008), the United States (Naoum, 2003), and the United Kingdom (Bresnen & Marshall, 2000) prove that collaboration leads to improved project delivery. Projects were delivered earlier, within budget, with less conflicts, work defects, and claims. Suprapto, Bakker, and Mooi (2016) researched the relation between the teamwork quality and project performance. There is a positive correlation between teamwork quality and project performance.

To increase collaborative practices during projects, multiple challenges need to be overcome. To successfully improve collaboration fundamental changes in organizational structure, administrative procedures, design processes, field operations, and use of technology are needed (Chinowsky & Songer, 2011). These challenges are apparent on industry, company, and individual level. The fragmented nature of construction projects

challenges the ability for construction industry to fully incorporate collaboration (Rowings, Mark O. Federle, & Birkland, 1996).

Increased forms of collaboration require participants to create an understanding of each other's operations, technology, and finance (Ibbs, Kwak, Ng, & Odabasi, 2003). Trust and extensive communication among the participants are required to share such information (Khalfan, McDermott, & Swan, 2007). Participants have to look beyond self-interest and consider the view of others on the project.

The difficulties of the construction industry and the moment of implementing organizational changes during the construction phase affect the chances of success of managerial interventions. Besides the challenges, new approaches emphasizing the importance of collaboration are developed and increasingly used. The results found in scientific literature prove that the approaches add value. However, it remains unclear what the effect of increased collaboration during the construction phase is.

1.5 The Relevance of Studying Organizational Effectiveness in the Construction Industry

To efficiently and effectively stimulate collaboration amongst people, behavioral change is needed. According to L. L. Cummings (1983), organizational behavior is an instrument to produce effectiveness. *"Most major managerially controllable determinants of effectiveness operate on productive behavior... These need to be assessed as leading indicators of subsequent changes in effectiveness."* Within a project organization it is highly relevant for managers to understand the principles of behavior and behavioral change. People need to act differently than they are used to. Changing their behavior is a pivotal challenge and one of the aspects which can lead to a more effective organization. Currently, the 'soft' side of project management is underexposed. Stakeholder management is eminently the instrument to implement interventions concerning collaboration. The basis of people's behavior is related to the disciplines of psychology, sociology, and anthropology. Besides, *people are key* in the construction industry, these aspects are underexposed. There is a knowledge gap concerning the effect of behavior within the construction industry.

1.5.1 Organizational Behavior

Organizational behavior is not clearly defined but Griffin & Moorhead (2014) give a workable definition: "*organizational behavior (OB) is the study of human behavior in organizational settings, of the interface between human behavior and the organization, and of the organization itself*". To fully understand organizational behavior, three areas are important: *human, group,* and *organization* (Figure 3) (Griffin & Moorhead, 2014; Robbins & Judge, 2013). The entities interact with each other in a construction project. These interfaces between the entities influence behavior. A human is influenced during the interaction with a group (1) and with an organization (3). This also applies for group behavior. A group is influenced by humans (1) and an organization (2). Organizational behavior is the discipline where all behavior comes together (4). Moreover, the environment influences all entities. Without studying all entities, no comprehensive understanding can be created.

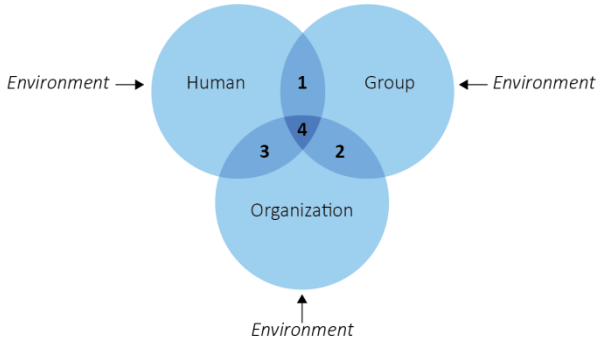


Figure 3 Organizational Behavior Entities – based on (Robbins & Judge, 2013)

1.6 Problem Statement

The current organizational structure of the RAHC project is not efficient and effective enough to deliver the project at the agreed completion date. Management of Fluor decided to intervene by forming a coalition of critical stakeholders. By means of the coalition, collaboration between actors should be stimulated. Increased collaboration should speed up the construction process. In addition, the management of Fluor acknowledged the idea that *people are key* within this process. Getting insight in the way people behave and react on the coalition could lead to new knowledge and insights to improve managerial practices. This knowledge can be used at the RAHC project and future projects.

One of the objectives of a project manager is to increase the effectiveness of the project organization. From a scientific perspective, the importance and value of people and collaboration is acknowledged. Therefore, it becomes relevant for project managers to understand the behavior of project members. Also in the construction industry, theories incorporating collaborative practices are increasingly used. However, there still is a knowledge gap concerning the effects of forming a coalition. The intervention is implemented during the construction phase of the project. This means that most structures are already constituted. For example, the majority of the contracts are already signed. This could have an influence on the effect of the intervention. So, there is also a knowledge gap regarding the effect of intervention during the construction of a large engineering project.

2 Research Design

This chapter describes the design of this research. Section 2.1 elaborates on the research objective. In order to achieve this objective, a research question and sub-questions are defined in section 2.2. In section 2.3, the scope of the research is established and explained. The research strategy given in section 2.4 elaborates on the strategy to conduct this research.

2.1 Research Objective

As described in the Introduction, this research contributes to the gap of the 'soft' aspects in construction management. The construction industry gets increasingly aware of the potential value of managerial interventions related to people. This manifests in organizational effectiveness studies in the construction industry. Organizational effectiveness is determined by organizational behavior of people.

The goal of this research is to measure and understand the effect of setting up a coalition on organizational behavior during the construction phase of large engineering project. This is both practically and theoretically relevant. From a scientific perspective, this research adds to the existing literature by researching the effect of coalition formation on organizational behavior in the construction industry. From a practical point of view, this research adds value by researching the impact of managerial interventions. The managing contractor can get new insight in organizational effectiveness and behavior to improve its management practices. The research objective is defined as:

> **Research question**: What is the effect of a coalition during the construction phase?

Underlying this research is the belief that behavior is not random. The objective is to identify fundamental consistencies underlying the behavior of all individuals and modify them to reflect differences. These fundamental consistencies are relevant because they allow predictability. This systematic research looks at relationships, attempting to attribute causes and effects, and basing conclusions on scientific evidence. By obtaining data gathered under controlled conditions and measured and interpreted in a reasonably rigorous manner, this is possible (Robbins & Judge, 2013).

2.2 Research Question

To obtain the research objective, a research question is defined. After analysis of the scientific and practical context and defining the problem statement and research objective, the following research question is formulated:

> **Research question**: What is the effect of a coalition during the construction phase?

This research question is divided into sub-questions. By answering each sub-question, the final answer of the research question can be given. The following sub-questions are defined:

> **Sub-question 1:** What is the difference in contractual structure before and after the coalition formation?
> **Sub-question 2:** How can organizational behavior be measured?
> **Sub-question 3:** What is the effect of the coalition on actors?
> **Sub-question 4:** What are drivers of actors to change their behavior?

Sub-question 1 elaborates on the contractual structure before and after coalition forming. The contractual differences possibly affect individual and group behavior. The type of contract could determine in which way

a stakeholder acts and will act. Therefore, it is necessary to understand the contractual structure. Moreover, this question concerns the difference in collaboration before and after coalition formation. The implementation of the coalition could lead to a new organizational structure. The initiated interventions as part of the coalition intervention are researched too. The decision-making process of the project management during the coalition forming is valuable to understand.

Sub-question 2 concerns the method to measure organizational behavior. This research is conducted in a specific context. These constraints need to be taken into account to develop a suitable measuring method. The objective is to weekly measure organizational behavior of project employees.

Sub-question 3 gives answer to the effect of the coalition on people's behavior. Organizational behavior aspects are measured in a certain time period. This question elaborates on differences between the actors based on multiple variables.

Sub-question 4 describes the reasons why actors change their behavior if they changed at all. The implemented interventions are possibly the cause for the change of behavior, if behavior changes. Understanding the reasons why behavior changed is of great value for the managing contractor and future research.

2.3 Research Scope

A research scope is required to define what is excluded and included in the research. This research is conducted for the project management team of the RAHC project. Other projects are not taken into account. The scope concerning the physical environment is limited. The research is conducted at the RAHC project site which is located at the ESSO refinery in Rotterdam, The Netherlands. The number of people working on the project depends on the activities performed. The maximum occupation is approximately 1.500 people coming from more than ten different countries. People outside the RAHC project organization are able to influence the project but are not taken into account in this research. This research is conducted in the project office for a period of six months. At the day of writing, the project is in construction.

Organizational behavior studies the impact that individuals, groups, and organization systems have on behavior within organizations, for the purpose of applying such knowledge toward improving organizational effectiveness (Robbins & Judge, 2013). It studies three determinants of behavior in organizations: individuals, groups, and organization systems. These determinants are affected by multiple aspects (contribution). The quantitative research focuses on aspects which influence individual and group behavior. The qualitative research focuses on the organizational structures.

2.4 Research Strategy

To obtain the research objective, a research strategy is set-up. This research is an empirical study and is both qualitative and quantitative. This research is a longitudinal case study of the RAHC project. The RAHC project is a specific situation and requires a contextual solution. The study conducted in this report is an action research. Action research means participating in the changing situation and simultaneously conducting research. Thus, gathering data, analyzing data, and researching scientific theory happen at the same time. Action research has an iterative character. Action research is essentially inductive because conclusions will be drawn based on observations. Nevertheless, a part of the action research is deductive because the theory derived from the scientific literature review is used to set-up survey questions. In Figure 4, the overview of the research strategy is given.

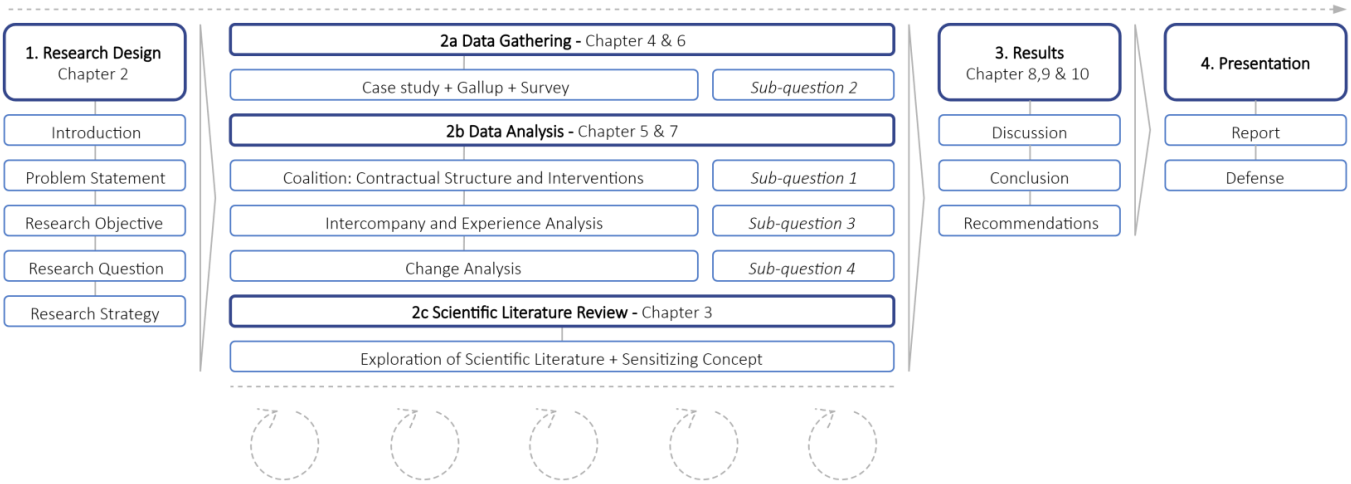


Figure 4 Research Strategy

2.4.1 Case Study

According to Yin (2003, p. 13), a case-study is defined as "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not clearly evident.*". Case studies should be used when researchers need to include contextual factors in their research. This research studies one case: the RAHC project. According to Cassell and Symon (2004), case studies are especially suited when a comprehensive understanding of social or organizational processes is desired. Case studies can contextualize phenomena and provide in-depth descriptions and insightful understanding (Yin, 1981). To explain and understand these phenomena it is valuable to use multiple research methods because this increases the validity (Cassell & Symon, 2004). This research makes use of four methods: document analysis, scientific literature study, Organizational Behavior Survey, and a Gallup survey. Setting up a case study requires five steps (Yin, 2003): (1) design the research, (2) prepare for obtaining data, (3) obtain the evidence, (4) analyze the evidence, and (5) report the study.

2.4.2 Designing the Research

This case study is an action research. "*Action research is a systematic approach to investigation that enables people to find effective solutions to problems confronted in their everyday lives.*" (Stringer, 2007, p. 1). This is in contrast with traditional research methods which try to deduct generalizable explanations from specific situations. Action research is in particular suitable in situations where people in organization tend to improve the effectiveness of the work (Stringer, 2007). This is in line with the described research objective.

Action research has been criticized because of its on-off character and lack of rigor. There is no possibility to repeat the same research because each inquiry differs from the last. It is possible to test theories multiple times, but each situation is different. However, this critique is countered by Reason and Rowan (1981) as action research provides opportunities of insight which cannot be obtain using other researching methods because the people within the organization are directly involved in the research.

2.4.3 Preparing for Data Collection

Data is obtained by analyzing documentation, reviewing scientific literature, and surveying. This research is a longitudinal case study. At multiple moments during the RAHC project, data is obtained.

Data Collection

In order to get a good understanding of the RAHC project and the coalition forming process, documentation of the RAHC project is collected. According to Yin (2003), a researcher collecting data should make use of four tactics. To construct validity, (1) multiple sources of evidence are used and (2) a chain of evidence is

established. To create reliability, (3) a case study protocol and (4) a case study database are developed. Information is derived from documents such as meeting minutes, financial and time prognoses, former RAHC case-study researches, and organizational structures.

Theoretical Study

A theoretical review of the current scientific literature of organizational effectiveness and behavior in a construction project is conducted. The literature review can be characterized as desk research and is mainly deductive. For the theoretical study there was no need for the author to go into the field in order to observe and collect relevant material (Verschuren & Doorewaard, 2010). According to Webster and Watson (2002) two types of scientific literature reviews exist. On the one hand, a mature topic can be analyzed and synthesized. The author should synthesize and extend existing research. On the other hand, an emerging issue can be examined and the author develops a new conceptual model based on fresh theoretical foundations. In this research, both types of scientific literature reviews are conducted. Organizational effectiveness and behavior is widely researched within the domain of organizational management. Since it is relatively new in the construction industry, existing research within the management domain is reviewed and applied in the construction context. In this industry, organizational effectiveness and behavior becomes increasingly important (Chinowsky & Songer, 2011).

Surveys

Structured interviews are held in the form of surveys. Two types of surveys are used to collect the data: the Organizational Behavior Survey and the Gallup survey. The Organizational Behavior Survey is constructed according to the steps defined by Edwards & Thomas (1993). In Appendix A, an extensive overview of the steps is given. The questions of the survey are based on the theoretical review and relevant aspects which affect organizational behavior derived from the theoretical study. The survey is conducted for a period of 14 weeks. Using the survey, dependent variables are measured. In scientific literature, independent variables are also called outcome variables (Field, 2018). The aspects which influence organizational behavior are the dependent variables. They are related and correlated and therefore not mutually exclusive and cohesively exhaustive (Robbins & Judge, 2013). A part of the objective of this research is to determine if the variables change over time due to the managerial interventions. The variables are measured to determine if these variables affect organizational behavior. To keep the errors in the survey as low as possible the validity and reliability of the research method need to be taken into account (Field, 2018).

The Gallup survey is used to measure the taskforce's satisfaction. The survey consists of Gallup's Q12 questions which measure the most important aspects of employee engagement (Gallup, 2018). The scores are derived from a 5-point Likert scale (1 *strongly disagree* up to 5 *strongly agree*). The Gallup's Q12 test can be found in Appendix B. The surveys are held since August 2014 and in total seven surveys are conducted. The last survey is conducted during this research in January 2018. The objective of conducting this survey is to observe changes in employee satisfaction level.

2.4.4 Collecting the Evidence

During this longitudinal case research, multiple moments in time are used to collect the evidence. The collection of documentation was an ongoing process. Documentation is derived from an internal database of the managing contractor. To understand all information written in the documents, unstructured interviews with managers and senior employees are conducted. Collecting scientific literature was also an ongoing process. The Organizational Behavior Survey was conducted weekly starting week 50 – 2017 until week 11 – 2018. Over 1600 surveys were collected during this period. More than fifteen companies contributed to this survey. The Gallup survey was sent to personnel of the client and managing contractor in January 2018. The total number of respondents was 117.

2.4.5 Analyzing the Evidence

The main objective of the research is to measure a difference of the effect of the coalition on organizational behavior. The situations, before, during, and after the interventions are analyzed and compared with each other. If a difference is found, this means that something has changed. However, the reason of the change is not necessarily contributable to of one the aspects which influence organizational behavior. The data is analyzed both qualitatively and quantitatively.

Qualitative Analysis

Qualitative data is obtained by the documentation analysis, unstructured interviews, and the theoretical study. There is no standard method to analyze documentation (Eisenhardt, 1989). The objective of documentary analysis is to get familiar with each case. Different forms of analysis can emerge to generalize patterns. Abbott (1995) proposed to use sequence analysis to understand longitudinal data. In this research, a sequence of the decisions made during the coalition formation process is derived from documentary analysis. Moreover, the organizational and contractual structures before and after the coalition forming are compared. At last, the project cost and duration prognoses graphs are compared with the measured organizational behavior aspects.

Theories and analyzing methods derived from scientific literature are used to analyze the case study data. The Organizational Behavior Model, developed by Robbins & Judge (2013), is modified and used to analyze the coalition interventions. Moreover, the aspects combined in this model were the input for the Organizational Behavior Survey. The RC Sunflower model developed by Chan, Chan, & Yeung (2010) is used to analyze the contractual differences before and after the intervention.

The data retrieved from the Organizational Behavior Survey is qualitatively analyzed. The data are written suggestions for improvement for the project. Descriptive coding is used in this research to summarize the passage of the data. The codes are identifications of the topic. Descriptive coding is appropriate for almost qualitative researches and has the primary objective is to help the reader understand the findings (Saldana, 2009). Also, descriptive coding is suitable if data is retrieved at multiple moments in time.

Quantitative analysis

The data obtained from the organizational behavior survey is quantitatively analyzed. IBM SPPS Statistics version 25 is the software used to analyze the 1600+ data entries. The extensive database gives a good starting point for a wide variety of analyses. Amongst others the following analyses are performed:

- **Comparison of averages.** Determining the sum score per question, allows creating a basis to compare the scores concerning different variables. For example, the scores per company can be compared. However, this is not statistically correct because the company (subgroup) is an entity on itself and is influenced by different factors than another company (Field, 2018). The comparison of averages is used for interpretation.
- **Exploratory Factor Analysis (EFA).** The EFA is used in multivariate analysis to discover the underlying structure of the set of variables (Field, 2018). The objective is to identify underlying relationships between variables. In addition, correlation coefficients between the questions can be derived using this analysis.
- **The Kruskal-Wallis test**. This test is used to compare two or more groups to determine if there are significant differences of an ordinal or continuous dependent variable (Field, 2018). This test can be performed even when the sample sizes of the groups differs. Furthermore, the test is performed to analyze the change of sum scores over time.

3 EXPLORING LITERATURE

In this chapter, scientific theories relevant to the research objective and questions are described and interpreted to create a better understanding. This chapter elaborates on relevant theories about contract law (section 3.1), project management and organizational effectiveness (section 3.2), organizational changes, and organizational behavior (section 3.3). At last, in section 3.4, the theory is sensitized. Insights deriving from the scientific literature are the input for the case study research.

3.1 Contract Law

An important part of project management of a large engineering project is the contracting process. Contracting is relevant during the complete project-lifecycle. In the oil, gas and petrochemical industry, engineering contractors are key during the engineering, procurement, and construction of large engineering projects (Berends, 2007). A contract between the client and the engineering contractor constitutes a binding relationship between them. Contracts influence managerial and social action (Iansiti & Lakhani, 2017).

The contract specifies the obligations and liabilities towards each other and allocates risks. There are multiple types of pricing mechanisms of contracts which can be used by clients, engineering contractors, and subcontractors. In the construction industry, the multiple types of contract mechanisms are often used (Kerzner, 2017). Using a *fixed-price* or *lump sum* contract, the contractor needs to fulfill the assignment at a negotiated contract value. *Cost-plus-fee* or *cost-reimbursement* contracts are contracts where the client reimburses the contractor with the required costs to complete the defined work and an additional payment. Using *guaranteed maximum-share saving* contracts, the client pays the contractor a fixed fee and reimburses the actual costs of engineering, materials, and labor, till a certain amount. *Incentive* contracts are contracts where compensation is based on an agreed target concerning project performance. The *unit-price* contract is constituted by the estimated amount of items to complete the project and their unit prices. In the process engineering industry, this contract type is often used because the required resources are accurately defined in contract documents.

3.1.1 New Contracts

In the former described contracts, relationships between client and contractor are transactional: the client reimburses the contractor a defined sum. Both have certain obligations towards each other but there is no mutual responsibility for the project delivery. For a long time, the construction industry suffered from adversarial relations between project stakeholders due to little collaboration, limited trust, and ineffective communication (Chan, Chan, Fan, Lam, & Yeung, 2004; Moore, Mosley, & Slagle, 1992). Especially in large engineering construction projects, complexity increases due to the amount of different parties and their relationships. As a result, these complicated relationships can negatively influence project performance and therefore need to be managed effectively (Walker, 2011).

Relational contracting was introduced to overcome these problems of little collaboration, limited trust, and ineffective communication. It is an approach to help managing these complex relationships. The main principles of relational contracting are based on mutual benefits and win-win relationships by improving cooperation amongst parties (Chan et al., 2010). The objective of relational contracting is to develop relationships between project stakeholders by mutually creating a strategy of commitment, and employee involvement (Kumaraswamy, Rahman, Ling, & Phng, 2005). Others state that relational contracting is all about creating an organizational environment of trust, open communication, and employee involvement (Sanders & Moore, 1992). Essentially, the objectives of both scholars are similar. Kumaraswamy et al. (2005)

emphasized that a 'custom made' approach needs to be used to implement relational contracting because each situation and environment is different. A project organization should evaluate their business goals and evaluate in which way relational contracting or its principles could contribute to project performance. Ideally, a transformation from static relationships between contractors should transform to a shared culture and dynamic relationships which transcend one project life cycle (Rahman & Kumaraswamy, 2002).

The Australian Constructors Association (1999, p. 4) defined relational contracting: "*as a process to establish and manage the relationships between the parties that aims to: remove barriers; encourage maximum contribution; and allow all parties to achieve success.*" However, Chan et al. (2010) argue there is no universal definition of the relational contracting because there are many definitions. Due to the vagueness, there is a need for a mutual starting point in order to effectively make use of the concept. Chan et al. (2010) developed the *Relational Contracting Sunflower model* (Figure 5) based on the family-resemblance concept of philosopher Ludwig Wittgenstein. Other scholars in the construction industry also made use of the family-resemblance model to define the concept of construction partnering (Nyström, 2005) and construction alliancing (Yeung, Chan, & Chan, 2007). Chan et al. (2010) used the key elements of both models of Nyström (2005) and Yeung et al. (2007) to develop the *Relational Contracting Sunflower model*. A contracting practice can be defined as relational contracting practice if it contains the five core aspects of the model and some 'petals'. It does not matter which (set) of the petals are included. New configuration of the petals leads to new sets.

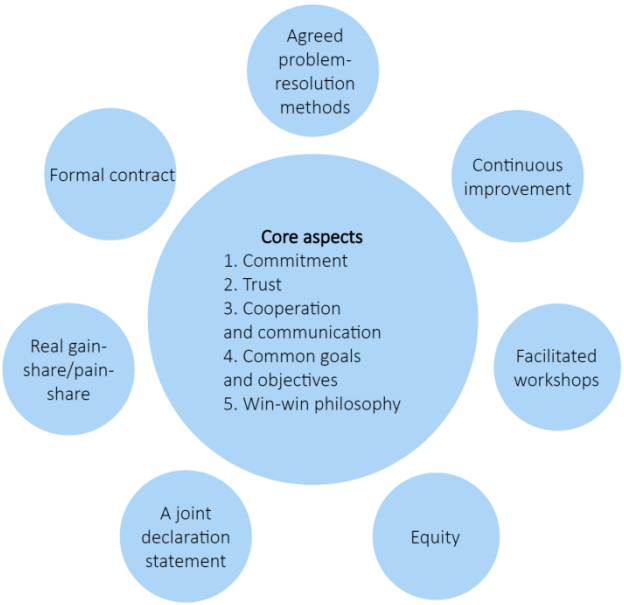


Figure 5 Relational Contracting Sunflower Model – based on (Chan et al., 2010)

The core aspects are derived from an extensive literature study and are selected based on the frequency of occurrence in relevant scientific publications (Chan et al., 2010). The most important aspects are briefly discussed below:

1. **Commitment**. According to multiple researchers, the core of relational contracting is the mutual engagement of stakeholders to follow a collectively developed strategy to meet certain objectives (Kumaraswamy et al., 2005; Thorpe & Dugdale, 2004).
2. **Trust**. Many scholars state that trust is the basis for relational contracting (Gil, Pinto, & Smyth, 2011; Jeffries & Reed, 2000; Kumaraswamy et al., 2005). It is a critical aspect for the success of the

relationships between companies. Mutual trust amongst parties is needed in order to create commitment.

3. **Cooperation and communication**. Cooperation and communication are required to start the collaborative process according to academics (El-adaway, Abotaleb, & Eteifa, 2017; Kumaraswamy et al., 2005). In order to successfully collaborate, excellent communication on personal-, business-, and operational level is needed (Hauck, Walker, Hampson, & Peters, 2004).
4. **Common goals and objectives**. Recognition of common goals and objectives during the partnering process is an important element of building cooperative relationships (Chan et al., 2010). Mutual goals and objectives are implicit to the need for a shared vision to enter in a relational contract.
5. **Win-win philosophy**. Having a win-win mindset during the partnering process is just as, common goals and objectives, an important aspect of building the contractual relationships (Kumaraswamy et al., 2005; Rowlinson & Cheung, 2004).

Relational contracting in the construction industry was introduced in multiple construction projects in the United States, the United Kingdom, Australia, and Hong-Kong in the early 2000s (Kumaraswamy et al., 2005; Palaneeswaran, Kumaraswamy, Rahman, & Ng, 2003; Rahman & Kumaraswamy, 2002). The benefits of relational contracting in these case studies are summarized in Appendix C, analyzed by Chan et al. (2010). More recent researches concerning the performance of relational contracting practices in public construction in China found that relational contracting adds significant success in quality performance and client satisfaction but not in budget and schedule performance (Ling, Ke, Kumaraswamy, & Wang, 2014).

3.1.2 Contract Management in Construction Phase

During the construction phase, most of the contracts are already awarded and signed. The type of chosen contract depends on various constraints such as product/process uncertainty, allocation of risk, in-house capabilities, and market conditions (Merrow, 2011; Turner & Simister, 2001). The chosen contract type incentivizes the client and contractor to collaborate to obtain their agreed objective within in certain boundaries (Morris & Pinto, 2007). In practice however, the type of contract influences the behavior of each actor. For example, under a lump-sum contract the contractor is expected to implement the best solution according to the agreed requirements (Turner, 2003). All project activities and corresponding risks need to be managed by the contractor too. There is little need for a client to be actively involved with the result that top-down information exchange and coordination is limited.

Under a reimbursable contract the contractor is reimbursed for his work while all risks are accounted for by the client (Turner, 2003). The client often gets the idea that the contractor wants to misuse the contract and over-supply to gain more profit. The client's suspicion stimulates him to extensively control the contracts (Merrow, 2011).

Partnering and alliance contracts are forms of relational contracting to stimulate collaboration to achieve mutually agreed upon objectives, develop trust and respect, and create joint risk management (Beach, Webster, & Campbell, 2005). In some projects, joint board governance and integrated project teams are set-up to increase teamwork (Beach et al., 2005). Suprapto et al. (2016) proved that projects with a partnering/alliance contract are associated with better relational attitudes than lump-sum and reimbursable contracts.

3.2 Project Management and Organizational Effectiveness

The study of organizational effectiveness is often focused on managers with decision-making power. Broadly, the functions of managers can be divided in planning, organizing, leading, and controlling (Griffin & Moorhead, 2014). Part of the field of project management is contract management as described above. Managers do these activities simultaneously. The main responsibility of managers is to optimize a variety of individual-level, group-level, and organization-level outcomes. Ideally, this leads to improved efficiency or effectiveness. In their decision-making, managers make trade-offs between the outcomes for each entity. The desired outcomes of the decisions can differ (Figure 6). The basic resources used by managers are human, financial, physical, and information resources with the goal to efficiently and effectively obtain organizational objectives.

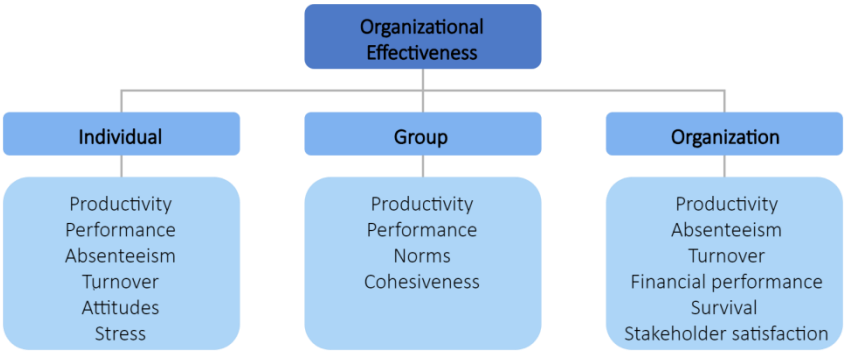


Figure 6 Potential outcomes of Organizational Effectiveness – based on (Griffin & Moorhead, 2014)

The managerial practices described above, also apply to project managers in the construction industry. Despite the temporary character of (construction) projects, their basic functions and resources are similar. Within the construction project management field of study, the iron triangle of time, cost, and quality was long perceived as the leading theory about project performance. Now, the focus of project management research shifted from hard aspects to soft aspects (people and social) (Suprapto et al., 2016).

As can be seen in

, the influence of project managers diminishes over time. So in the construction phase of a project, the manager has less influence on changing the project. The main responsibilities become leading and controlling. In this phase of the project, most employees are already working for a longer time on the project. They developed a certain way of working which influences their behavior. Looking at the complete project team, a project culture could establish which incorporates shared norms, beliefs, values, and assumptions. The effort to influence employee behavior and the project culture diminishes over time. Still, this phase in the project cycle offers opportunities to increase project performance.

3.2.1 Organizational Changes

If project managers implement interventions, they are per definition changing the organization. With each decision, trade-offs are made concerning individuals, groups, and organizations. During the implementation of changes, managers rank employee morale and retention as the least important objective of the change according to the research of Huczynski and Buchanan (2007). They show that major changes in organizations often lead to poor financial outcomes and low employee morale and retention. This led to low employee participation in the design and implementation phase. Whittington (2002) argues that if changes need to be successful, the soft human side needs to be integrated with hard structures and systems.

There are multiple forces which stimulate or force organizational change (Griffin & Moorhead, 2014; Robbins & Judge, 2013):

1. **People**. Project actors have changing demands regarding training, benefits, workplace arrangements, and compensation systems. Social trends can influence the actor's decision-making processes.
2. **Nature of the workforce**. Organizations have to take into account the multicultural environment, demographic changes, immigration, and outsourcing.
3. **Technology**. Technological development is continuously changing and creates opportunities and threads.
4. **Economic shocks**. Economic shocks could force organization to elimination, bankruptcy, or merging.
5. **Competition**. Other companies and organizations can become competitors and are threatening the organization's business model.
6. **Politics**. Politics have a large influence on project organizations. On world, national, and local scale, politics affect project organizations.

These forces influence the decision making processes of people within organizations. In large construction projects, project management is often outsourced to a contractor. The contractor in this case manages the project organization. They become responsible for implementation of organizational changes. Logically, the client profits from a more efficient and effective organization. Increasing the effectiveness of organizations is called organizational development. "*Organization development is a systemwide application and transfer of behavioral science knowledge to the planned development, improvement, and reinforcement of the strategies, structures, and processes that lead to organization effectiveness.*" (Cummings & Worley, 2005, p. 1&2). The definition incorporates organizational change. Without change, an organization cannot become more effective. Rearranging the organizational structure, task division and authority, and reporting relationships are called structural change. Structural change has an effect on organizational behavior aspects such as performance appraisal, decision making, and communication (Griffin & Moorhead, 2014). Organizational change can happen statically or/and dynamically. Lewin (1951) argues that planned change in organizations should follow a multi-stage sequence (Millert & Friesen, 1982). It is a static process of transition of an old situation to a new situation (Figure 7). First, the old situation is unfreezed to raise awareness for the need for changes. Second, the change is implemented. Third and last, the 'new' behavior is permanent adapted and will not change in the future.

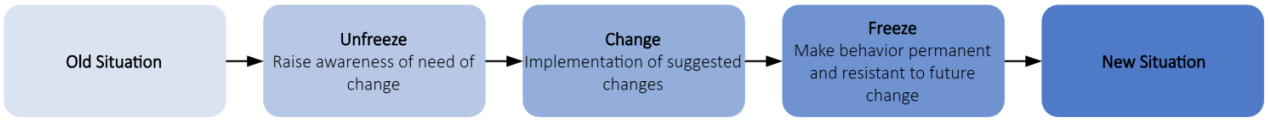


Figure 7 Static Change Process – based on (Millert & Friesen, 1982)

Another approach to implement organizational change is the dynamic or agile way (Figure 8). Again, this process consists of an old and a new situation. The process of changing is iterative and different from the static approach. First, the problem is recognized and defined. Second, the problem solving process starts. This is translated into a strategy how to overcome the problem. Third, the planned changes are implemented. Fourth, the changes are measured, evaluated, and controlled. If it turns out, the problem is not appropriately solved, a new iteration is required, just as long till the problem is solved. This process is often guided by a change agent. However, the project manager who decided to change also can play the role of a change agent.

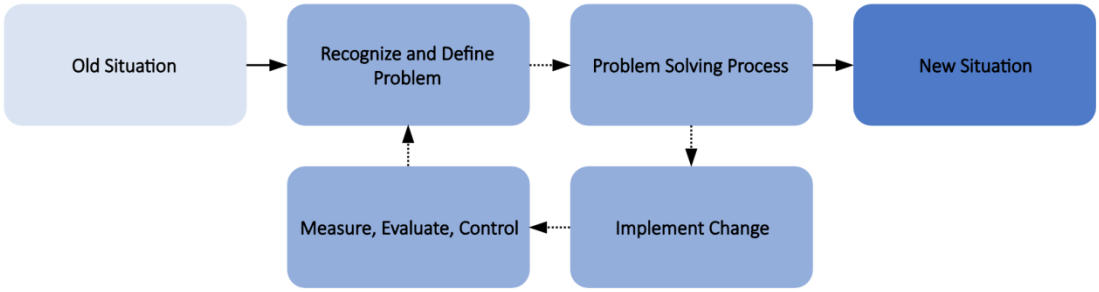


Figure 8 Dynamic Change Process – based on (Millert & Friesen, 1982)

Structural change and resistance

Structurally changing an organization inevitably comes along with resistance amongst project members. Studies even show that people who are confronted with substantiations which shows a proven need for change, stick to their old way of working and try to find data which substantiates this (Audia & Brion, 2007). Moreover, people who suppress their thoughts of changing are more sick and quit their job earlier than others (Fugate, Kinicki, & Prussia, 2008). However, resistance to changes is not always negative. Critically evaluating the suggested changes can be valuable because it could lead to new alternatives or alert the organization for relevant threats (Lawrence, 1969). Without resistance, changes could be implemented without careful examination. If changes are examined and discussed openly, the resistance has a positive effect on the changing process (Ford, Ford, & D'Amelio, 2008).

Resistance towards changes has organizational and individual sources. Organizational sources are constituted within the organizations. Katz and Kahn (1978) identified six contributing organizational resources which create resistance:

1. **Structural inertia**. Project organizations have structures in place to ensure stability for project members. Employee selection procedures and formalized procedures are examples of these internalized structures.
2. **Limited scope of change**. Organizational changes have an effect on (sub-)systems of organizations. These systems are interdependent and changing one system does not give the desired effect because the other systems are still in place.
3. **Group inertia**. Obtaining a critical mass to change group behavior can be difficult due to group norms.
4. **Threatened expertise**. Planned changes can affect the expertise built up by individuals and groups.
5. **Threatened power**. Changing power relationships between actors can work disruptive. Project members may resist their change of power such as decentralization interventions.
6. **Resource allocation**. Groups and individuals that are satisfied with the current allocation of resources can oppose the implementation of re-allocations. For example, the increased use of part-time project members can be undesirable.

Individual reasons for resistance arise because of human characteristics and behavior. According to Griffin and Moorhead (2014), there are six resources which allow for resistance towards organizational changes:

1. **Habit**. Humans develop programmed responses to deal with life's complexities. Within organizations project members also develop habits. Changing these habits can lead to resistance.
2. **Security**. Project members develop a feeling of security and safety with their way of working. They are likely to resist adjustments if these values are possibly affected.

3. **Economic factors**. Changes can lead to concerns about financial rewards. Project members may think that they cannot perform their job or task anymore.
4. **Fear of the unknown**. The outcomes of planned changes are by definition unknown. Project members can get anxious towards the interventions because the outcome is ambiguous.
5. **Lack of awareness**. If the planned changes are not communicated clearly or project members are ignorant towards the signs of change, project members can miss the message and will not alter their behavior.
6. **Social factors**. Project members may perceive the changes as different from the group standard and experience social pressure.

Overcoming resistance to change

Project managers play an important role to overcome the difficulties caused by the reaction to the new change of people in the organization. Academics suggest that the ability to adapt to changes is a part of someone's personality (Oreg, 2006). Managers are able to positively influence the individuals and group. Managers should have a comprehensive understanding how to overcome the resistance to change. Kotter and Schlesinger (2008) developed six strategies to overcome resistance:

1. **Education and communication**. Educating project members is a common method to anticipate on resistance on beforehand. Communication is necessary to transfer the relevant information to all involved. People's anxiety decreases when they are informed about the change (Rafferty & Restubog, 2010). Training (education) and communication are both aspects which affect organizational behavior.
2. **Participation and involvement**. When resisters participate early in the change development, they can overcome their resistance. Project members are more willing to change when they feel committed to their project (Peccei, Giangreco, & Sebastiano, 2011), because when they have low emotional commitment they are less open to change (Huy, 2002). In addition, initiators of the changes are able to take into account the view of the resisters to create a more solid change strategy.
3. **Facilitation and support**. Project managers can help overcome resistance by being supportive towards project members and ensure appropriate facilitation. Supportive actions are for example providing training for new skills and give mental support. Project members who trust their supervisor are more willing to accept changes (Kotter, 2007). Also, employees who feel supported have a more positive attitude towards change (Van Dam, Oreg, & Schyns, 2008). Facilitation and support are most effective when fear and anxiety are the causes of resistance.
4. **Negotiation and agreement**. Project managers can give resisters offers to implement changes. Especially if one of the resisting project members is critical in the change process, to solve the dead-lock with a negotiated offer. However, negotiating an offer can be risky for the project manager because he can be blackmailed.
5. **Manipulation and co-optation**. Sometimes it is useful as manager to influence others. In this context, manipulation is the transfer of very selective information and percipient structuring of events (Kotter & Schlesinger, 2008). Co-optation is a form of manipulation and means giving someone or a group a desirable responsibility to implement the change. This is different from collaboration because the appointed person or group did not deliberately choose to get this role. Manipulation is a risky strategy because to successfully implement an intervention, it is crucial that project members understand why change should be made and perceive it as consistent and fair (Fedor, Caldwell, & Herold, 2006).

6. **Coercion**. People are forced to accept the implementation of the change. On the one hand, a manager can explicitly force project members by firing or transferring them. On the other hand, a manager can implicitly threaten employees by the loss of jobs, reducing promotion possibilities etc. Just as manipulation, this strategy is risky. Nevertheless, sometimes a project benefits from this strategy if time is key for example.
7. **Team configuration.** Robbins and Judge (2013) suggest a seventh strategy: selecting the right project members on beforehand can forestall resistance.

Kotter and Schlesinger (2008) identify two common pitfalls of managers implementing planned change. On the one hand, managers only use one strategy or a limited amount of strategies. Paradoxically, managers are not able to adapt to the situation, especially when the situation changes during the implementation of the planned interventions. On the other hand, managers make the mistake that they do not clearly consider the change and see the process as disjointed and incremental.

3.3 Organizational Behavior

The main goal of studying organizational behavior is to improve organizational effectiveness (Robbins & Judge, 2013). As mentioned in the Introduction, organizational behavior is applicable to and determined by the individual, group, and organization. Organizational behavior is an applied behavioral science and built on the disciplines psychology, social psychology, sociology, and anthropology (Robbins & Judge, 2013). Psychology concerns individual behavior. Social psychology is a part of psychology and studies both individual as group behavior. Sociology researches the relation between people and their environment and culture. So, this refers to group behavior and organizational behavior as part of the environment. Anthropology is the study of societies of humans. This is constituted in group and organizational behavior.

Each unit of analysis consists of multiple aspects. Below in Figure 9**,** the aspects are given per unit of analysis (individual, group, or organization). These aspects are not mutually exclusive because the aspects influence each other.

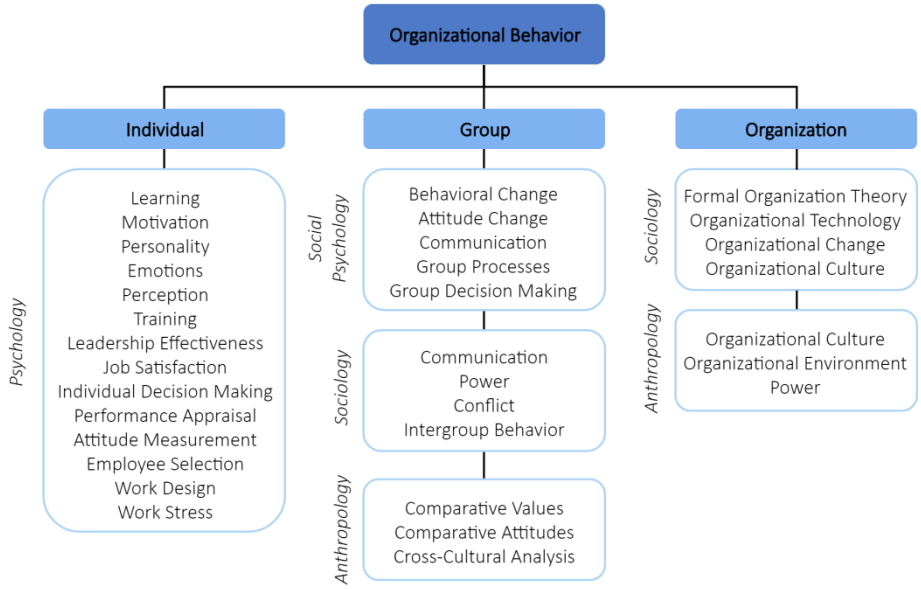


Figure 9 Organizational Behavior Disciplines – based on (Robbins & Judge, 2013)

3.3.1 Organizational Behavior Model

The aspects described above are acknowledged by multiple leading academics in the field of organizational behavior (Griffin & Moorhead, 2014; Robbins & Judge, 2013). Social behavior models are researched extensively; Getzels & Guba (1957) created a model which showed the dimensions of social behavior; Fishbein & Yzer (2003) made an 'Integrative Model of Behavorial Prediction'. However, the number of models to conceptualize organizational behavior are limited. Recently, Robbins & Judge (2013) developed the Organizational Behavior Model (Figure 10). This model can be used to represent the field of organizational behavior and proposes three types of variables; inputs, processes, and outcomes. These variables are applicable at individual, group, and organizational level of analysis. The definitions of the aspects are discussed in Appendix D.

Inputs are the variables which lead to processes. The variables determine what happens in the future. The individual inputs diversity, personality, and values are mostly predetermined and do not change easily (Robbins & Judge, 2013). Group structures, group roles, and team responsibilities change more often. Especially in the construction industry, where projects are unique and project teams change between projects. The organizational inputs are organizational structure and culture. These variables are enrooted in the firm's culture and are not easily changed.

Processes are actions that individuals, groups, and organizations follow from the inputs and direct to certain outcomes. On individual level, the processes include emotion and moods, motivation, perception, and decision making. The group processes consist of communication, leadership, power and politics, and conflict and negotiation. Group cohesion and group functioning are organizational processes.

Outcomes are determined by the inputs and processes. Knowing the outcomes helps to explain and predict organizational behavior. Measuring the impact of managerial interventions on the outcomes is valuable for future decision-making processes. The outcomes can also influence inputs in the future. Individual outcomes consist of attitudes and stress, task performance, citizenship behavior, and withdrawal behavior. Group outcomes determine human resource management and change potential. From an organizational perspective, increased productivity and better chances of survival are desired.

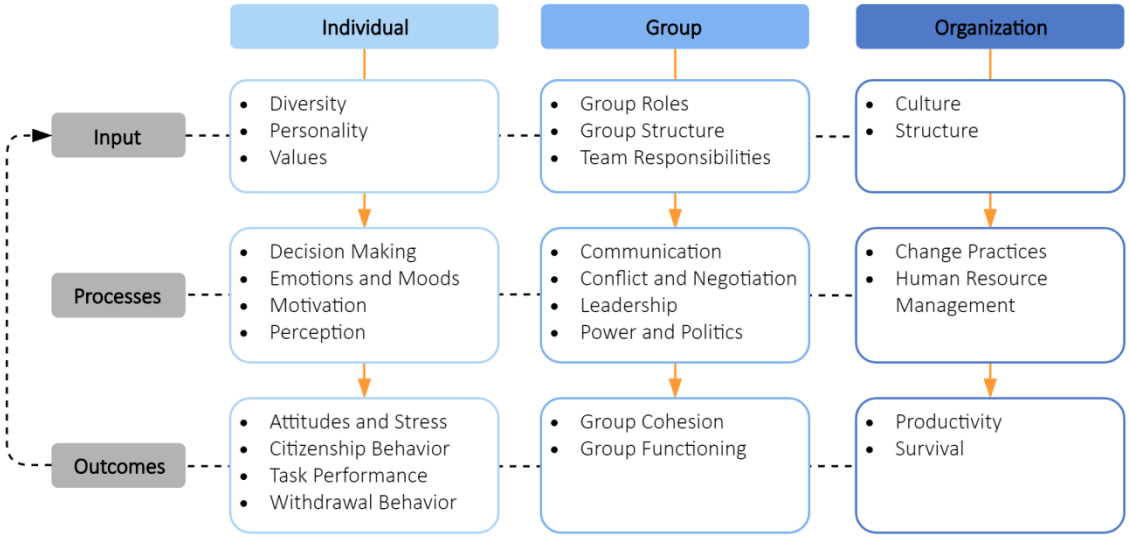


Figure 10 Organizational Behavior Model – based on (Robbins & Judge, 2013)

3.3.2 Organizational Behavior and Construction Projects

Construction projects are characterized by their temporary character and wide variety of disciplines and people coming together to obtain the same goal. A diverse range of psychological profiles have to work together. Each person has his/her own attitude and behavior which they will bring to site. Satisfaction of employees is inevitably an important aspect to manage. Unsatisfied and demotivated team members can cause serious problems for the project. On the contrary, a motivated and eager-to-win team could increase project success. This all falls in the scope of a project manager. The proposed interventions have the objective to change the organization and its people positively.

According to Walker (2011), not all organizational behavior aspects are relevant for the construction industry and organizational change. It is unlikely, that all aspects will change due to interventions. For example, by setting up a coalition the personality of an individual is unlikely to change. In addition, Walker (2011) adds more aspects which are relevant:

- **De-individualization.** *"De-individualization refers to an individual's loss of self-awareness and self-monitoring in a team situation."* (Walker, 2011, p. 224)
- **Synergy. "***Synergy is the aim of all teamworking to produce an output where the whole is greater than the of sum its parts*" (Walker, 2011, p. 223)
- **Trust**. "*Trust is a psychological state that exists when you agree to make yourself vulnerable to another because you have positive expectations about how things are going to turn out."* (Robbins & Judge, 2013, p. 387)

3.4 Sensitizing

This section combines the existing knowledge into a new framework. The framework helps researchers organize and experience data and are called *sensitizing concepts* (Buchanan & Bryman, 2013). It can be used as an instrument to combine new theoretical insights and empirical findings.

Organizational behavior covers a broad spectrum of topics. However, not all aspects are relevant for this research. This study researches the change of organizational behavior due to interventions initiated by project managers during the construction phase. The Organizational Behavior Model developed by Robbins & Judge (2013) forms a departure point for a new framework. Not all organizational behavior aspects are relevant within the construction industry according to Walker (2011). Some aspects are not relevant because it is highly unlikely they will change. Both types of aspects are excluded in the framework. Furthermore, the aspects de-individualization, synergy, and trust are included.

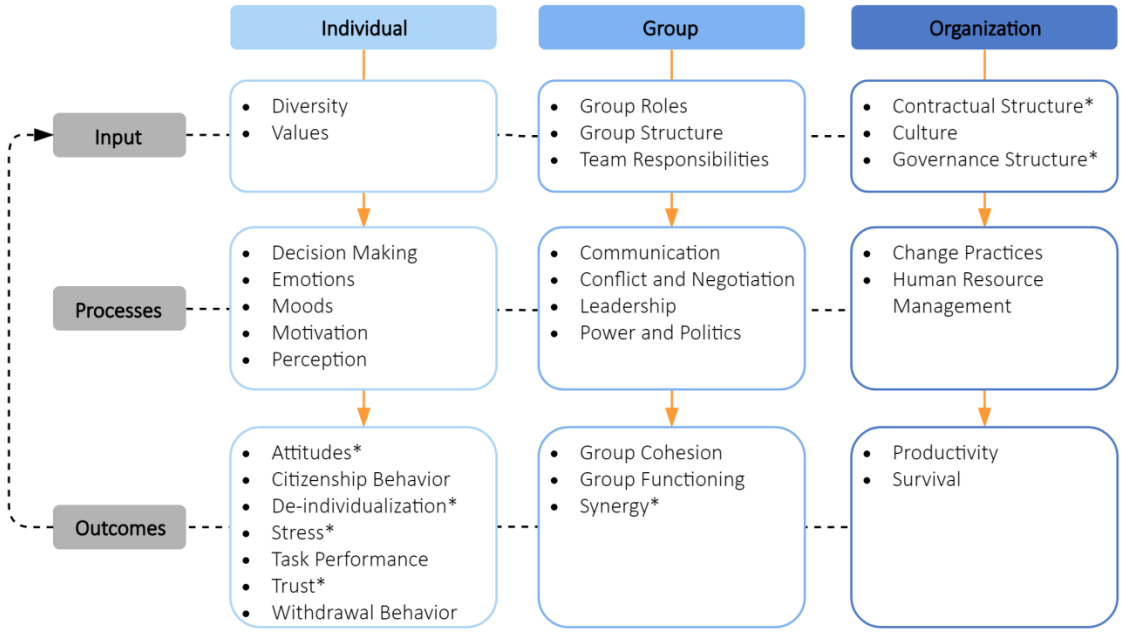


Figure 11 Organizational Behavior Change Model – based on (Robbins & Judge, 2013; Walker, 2011). *new aspects

4 Case Study Set Up

In this chapter the case study set up of the RAHC project is discussed. In section 4.1, the way in which evidence is obtained is discussed. In section 4.2, the constraints of the RAHC project are elaborated. In the last section 4.3, the development of the survey is described.

In order to construct a reliable case study a protocol and a study database need to be set up (Yin, 2003). The protocol needs to be followed for every case study to minimize errors and biases. This research focuses on only one case; the RAHC project. Ideally, this research is conducted at another case as well. The RAHC-project consists of approximately 1500 employees from multiple companies. The project site is separated in an office site and the construction site. The research is conducted in an office for a period of 6 months. Focusing on another case or on employees outside the project organization would not be beneficial for this research due to limited time.

4.1 Case Study Constraints

There are two reasons why all project members are considered as a relevant target group. First, the maximum occupancy during the construction phase is approximately 1500 people. The number of project members continuously changes as workers come and go. If a company finishes their job, it leaves again. This makes it difficult to select a specific target group for the hard copy survey. Second, the obtained data is analyzed quantitatively. Cronbach's alpha is used to estimate the reliability of a psychometric test (Nunnally, 1978). The research becomes more reliable with more data entries as Cronbach's alpha increases.

More than 15 companies are working on the construction of the project. The companies assigned by the managing contractor to construct the hydrocracker make use of their own subcontractors. The companies' subcontractors are within the scope of this research but will be categorized as the company. For example, the managing contractor contracts subcontractor A. Subcontractor A has its own subcontractors A1 and A2. In this research, subcontractors A1 and A2 will be labeled as subcontractor A.

Large construction projects are influenced by multiple internal and external factors which cannot or hardly can be controlled by humans. For example, the weather can, unfortunately, not be controlled. Some weather conditions such as strong winds or snow will negatively influence the construction progress. It is considered unsafe to work during these circumstances. The impact of these kinds of influences is difficult to measure and therefore is not taken into account during this research.

4.2 Survey Development

To quantitatively measure individual and group behavior, the Organizational Behavior survey (Figure 12) is developed based on the model in Figure 11. Ideally, all aspects are questioned. Because of the contextual constraints, such as limited time and no obligation for respondents to fill in the survey, not all aspects could be questioned. The objective of the coalition is to speed up productivity by increasing collaboration through multiple interventions. The questioned aspects (Table 2) are chosen in line with this objective and in accordance with the managing contractor and researchers from the TU Delft. The aspects focus on individual and group aspects. The data derived from the individual questions should make it possible to interpret emotion, stress, motivation, task performance, perception, and the attitude of individuals towards collaboration. In addition, the respondents are asked to assess communication, leadership, group functioning, and group cohesion. Some questions represent multiple aspects.

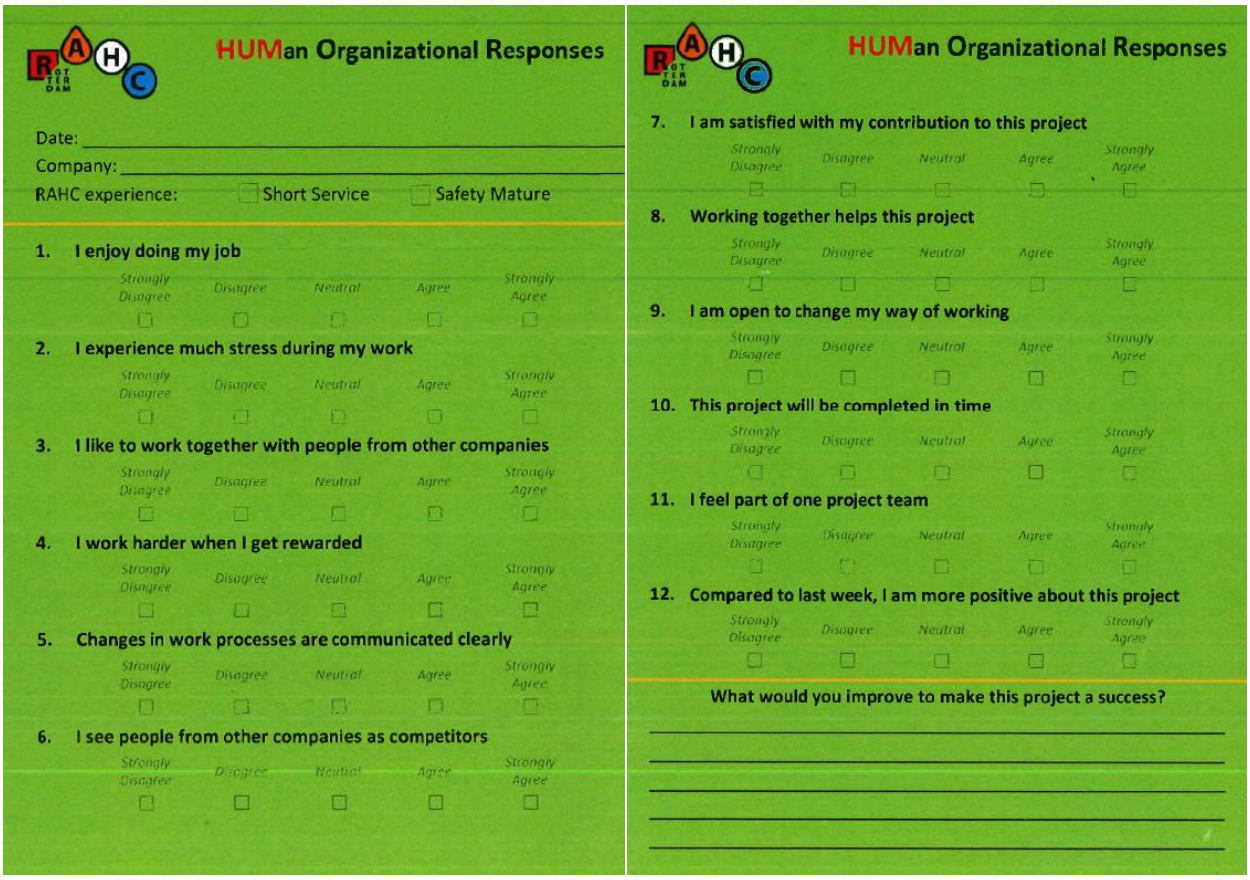


Figure 12 Organizational Behavior Survey

Table 2 Related Aspects

	Question	Aspects	Focus
1	I enjoy doing my job	Emotion	Individual
2	I experience much stress during my work	Stress	Individual
3	I like to work together with people from other companies	Attitude & Group Functioning	Group
4	I work harder when I get rewarded	Motivation	Individual
5	Changes in work processes are communicated clearly	Communication & Leadership	Group
6	I see people from other companies as competitors	Perception & Group Functioning	Individual
7	I am satisfied with my contribution to this project	Emotion & Task Performance	Individual
8	Working together helps the project	Synergy	Group
9	I am open to change my way of working	Attitude	Individual
10	This project will be completed in time	Trust	Group
11	I feel part of one project team	Group Cohesion	Group
12	Compared to last week, I am more positive about this project	Perception	Individual

4.2.1 Type of Data

Two types of data are acquired through this survey: qualitative and quantitative. Qualitative data is obtained using the open question. Quantitative data is retrieved using the questions concerning the date, company, experience, and behavioral aspects. The possible answers regarding experience and behavioral aspects are categorized. Experience is divided in Short Service and Safety Mature. Short Service means that the employee

did not obtain a certain safety maturity level. After six weeks an employee is allowed to take the safety test and become Safety Mature. Next to new personnel, a large part of the employees which do not directly work on the construction site are Short Service. The organizational behavior questions are answered using a Likert scale which is explained below.

4.3 Collecting the Evidence

First, a part of the project information and data about the project is derived from documentation and unstructured interviews. Used documents are meeting minutes, presentations, organizational charts and weekly project prognoses files. The documents were acquired from an internal database. Unstructured interviews helped to clarify the obtained data from documents. These unstructured interviews were conducted with project directors, construction managers, contract managers, and project engineers from the managing contractor. Also the input from client's and subcontractor's project directors and project managers were considered. The analysis of documents and interviews resulted in the data which is used in Chapter 5; information about the coalition, the formation process, and timeline. This analysis focusses on the organizational aspects of the Organizational Behavior Change Model (Figure 11).

Second, all project members working at the RAHC project location, were targeted to survey using hard copy survey cards. Employees were strongly suggested to fill in the survey but this was not obliged. Surveying started in week 50 – 2017 until week 11 2018. During the Christmas holiday most of the employees were not working and therefore no was data collected in week 52 – 2017 and week 1 – 2018. There was no official announcement of the survey start. The client's and managing contractor's employees and project managers and HSE managers of the subcontractors were informed during the distribution. Subcontractors were responsible to spread the word by themselves. On Wednesdays the cards were disturbed amongst the employees. For the client and the managing contractor the cards were distributed manually and placed on their desks. The majority of employees of the client and the managing contractor have a desk. HSE manager and construction managers of the managing contractor's subcontractors distributed the cards within their companies. Processing hard copy survey cards is a time-consuming activity and therefor the right balance of card distribution, collection, and processing needed to be chosen. The statistical analysis using the obtained survey data focusses on the individual and group aspects of the Organizational Behavior Change Model (Figure 11).

Third, the employees of the client and the managing contractor received in January 2018 an email with the Gallup survey. The data was obtained using Survey Monkey. This survey was used by Patil (2016) and sent to the client and the managing contractor. The managing contractor sent in total 8 surveys over a period of four years to the client and herself. Other companies than the client and the managing contractor were not considered for the Gallup survey.

4.3.1 Likert Scale

A five point Likert scale is used to answer the organizational behavior questions: *strongly disagree, disagree, neutral, agree,* and *strongly agree*. Likert scales can measure attitudes and are widely used in the behavioral research domain (Likert, 1932). One downside of the Likert scale is that respondents may lie to put themselves in a positive light. This effect can be reduced by using an anonymous survey (Paulhus, 1984). Using an anonymous survey limits the number of statistical analyses which can be conducted. Nevertheless, due to the possible impact on the data, the decision is made to create an anonymous survey.

Likert scales are used to derive ordinal data but also can be used as interval data. There is a continuous discussion concerning the interpretation of the data. On the one hand, researchers state that the intervals between the scale values are not equal. Then, only non-parametric analyses should be used with Likert scale

data (Jamieson, 2004). However, other scientists argue that Likert scale data can be used as interval data and parametric analyses can be used. The concerns regarding impact of parametric methods on the results are ungrounded according to Carifio & Perla (2008) and Norman (2010). In order to optimally make use of the obtained data, the assumption of equal interval of Likert scale value is made.

4.3.2 Effect of Multilingual Surveys

People with different nationalities are working on the RAHC project. To target the largest sample group, the surveys are translated in 6 different languages: Dutch, English, Italian, Polish, Portuguese, and Romanian. The translation is done by native speakers working on site and checked by other native speakers and Google Translate. Respondents interpreted questions differently due to multilingual surveys (Pérez, 2011). However, due to time-constraints, the assumption is made that the use of multilingual surveys does not affect the results. The obtained data is not corrected.

4.3.3 Common Method Bias

When self-reported survey data are used, the threat of common method bias has to be checked. Respondents can confound data by social desirability, leniency, acquiescence, and other social, psychological, and measurement factors (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This threatens the validity of the model and affects the drawn conclusions. During the survey development and data collection, the likelihood of bias was reduced by using an anonymous survey and providing no incentive for participating.

5 COALITION: CONTRACTUAL STRUCTURE AND INTERVENTIONS

In this chapter, the results of the case study are described. It focusses on the organizational aspects of the Organizational Behavior Change Model (Figure 11). In section 5.1, the coalition, the formation process, and its sub-interventions are discussed. Moreover, the link with the coalition and organizational behavior is presented. In section 5.2, the differences in contractual structure before and after the coalition formation are given. At last, the conclusion is drawn in section 5.3.

5.1 Coalition

Coalitions are formed to increase collaboration between team members to obtain organizational goals. Changing individual behavior is ultimately the objective of this coalition to improve the project progress. The managing contractor defines 'the coalition' as an overarching concept which consists of all actors that are still working on the project and are critical for the delivery process. The coalition consists of the client, the managing contractor, and four subcontractors. These stakeholders were allowed to join the negotiations about the remaining work and coalition framework. The objective of the negotiations was to stimulate collaboration between the team members, align objectives, and integrate work processes. The new turnover packages, boundaries, scope and status need to be defined. Subsequently, the execution needs to be optimized and at last the cost.

The introduced coalition can be divided in seven sub-interventions. All these sub-interventions are introduced as part of the coalition. In **Error! Reference source not found.**, the most important milestones of the coalition formation are presented which are explained in Table 3. Setting up the coalition followed a classical marketing process. In July 2017, first awareness about the problematic situation was raised by the managing contractor. The project- sponsors, director, and managers of the client and subcontractors were informed. Negotiations started to set up the coalition which included two formal alignment events in September 2017 (4EV01 and 4EV02). During the negotiations, interest for the involved stakeholders is created; earlier project delivery is beneficial for the client because the construction can be used earlier. For the managing contractor and the subcontractors earlier project completion means that the employees are earlier available for next projects. Therefore, the desire to join the coalition is created for all stakeholders. If the advantages outweigh the disadvantages or a critical mass of other stakeholders is created, it is inevitable that actors will join the coalition. Finally, the actors decided to join the coalition and follow the created strategy. The coalition was officially kicked-off in week 47 – 2017 (1-KO-01).

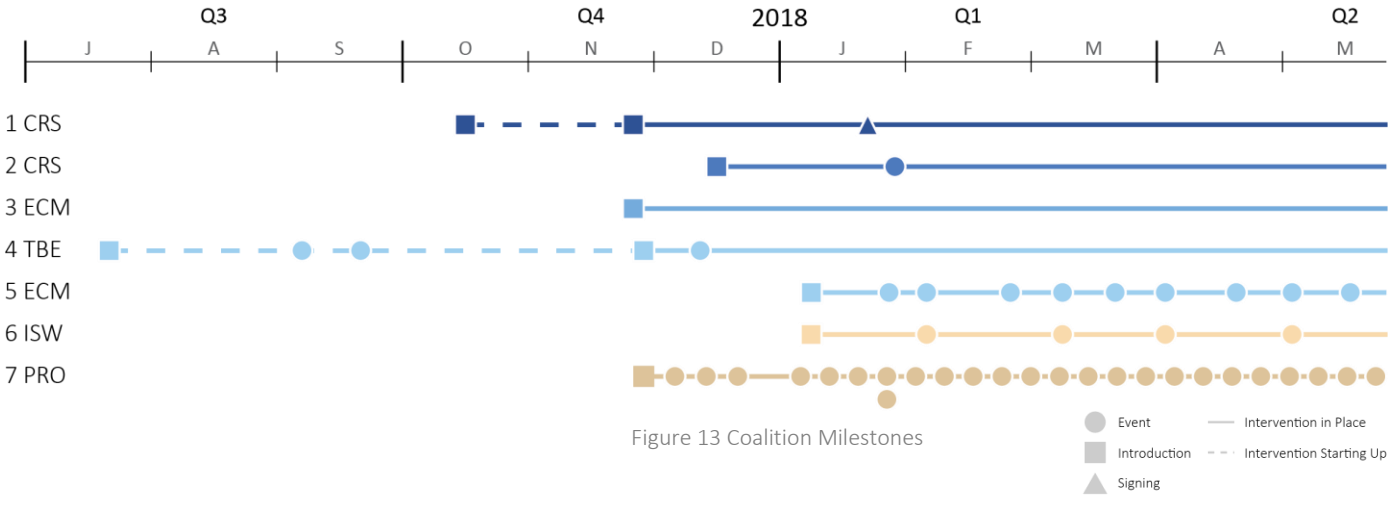


Figure 13 Coalition Milestones

Table 3 Coalition Sub-interventions

#	Intervention	Description	Actor	Milestone	Date	Code
1	**Contractor Reward System (CRS)**	Shared responsibility for possible bonus with time constraint	Group	Introduction Kick-off Signing Event	Week 42 Week 47 Week 3 Week 29	1-IN-01 1-KO-01 1-SI-01 1-EV-01
2	**Crafts Recognition Program (CRP)**	'Coalition' behavior is rewarded with financial reward	Individual	Kick-off Event	Week 51 Week 4	2-KO-01 2-EV-01
3	**New Expert Construction Manager (NCM)**	New CM with experience and knowledge to change behavior	Individual & Group	Kick-off	Week 47	3-KO-01
4	**Team Building and Alignment Events (TBE)**	Team building with coalition actors and objective alignment	Individual & Group	Introduction Event Event Kick-off Event	Week 29 Week 36 Week 38 Week 48 Week 50	4-IN-01 4-EV-01 4-EV-02 4-KO-01 4-EV-03
5	**Extra Coordination Meetings (ECM)**	Extra coordination meetings for coalition to stimulate collaboration	Individual & Group	Introduction Event Event Event	Week 2 Week 4 Week 6 Week 8	5-IN-01 5-EV-01 5-EV-02 5-EV-03
6	**Integrated Site Walks (ISW)**	Site walks with coalition Project Sponsors, Safety Managers & CMs	Individual & Group	Introduction Event	Week 2 Week 4	6-IN-01 6-EV-01
7	**Promotion (PRO)**	Progress dashboard and communication towards employees using posters & all hands	Individual & Group	Introduction Event *CRP* Introduction Event	Week 50 Weekly Week 51 Week 4	7-IN-01 7-EV-01.1 7-IN-02 7-EV-02

5.1.1 Coalition and Organizational Behavior

One of the objectives of this research is to determine which effect the coalition and the sub-interventions have on organizational behavior. An understanding of which aspects of organizational behavior are targeted as input for organizational change is needed. In Figure 14**,** the intervention coalition is analyzed using the Organizational Behavior Change Model. The situations before and after the coalition formation are compared. The initiated interventions give input for changes on individual, group, and organizational level.

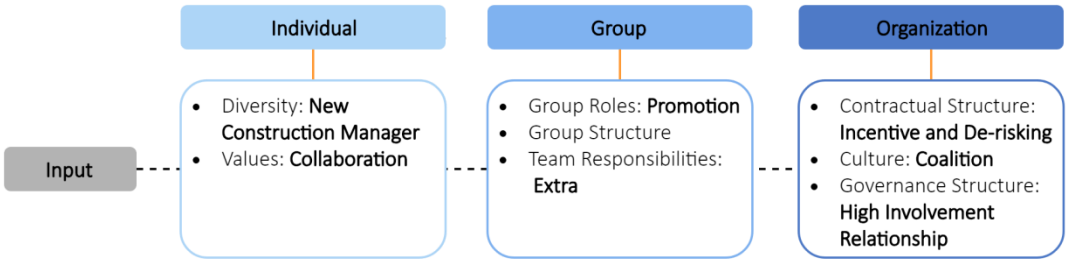


Figure 14 Targeted Aspects of Organizational Behavior

Individual level

On individual level, values of employees are targeted. Collaborative behavior is stimulated through the introduction of (2) Crafts Recognition Program, (3) New Construction Manager, (4) Team Building and Alignment Events, (5) Extra Coordination Meetings, (6) Integrated Site Walks, and (7) Promotion. It is unlikely that the personality of people will change due to the interventions and therefore is not targeted by the managing contractor. It is unclear if the interventions are effective. The changes are researched using the Organizational Behavior Survey which is explained in Chapter 6.

Group level

The group roles and team responsibilities changed due to the coalition formation. The group structure remained the same because the companies (groups) did not change the organizational structure of their company due to the coalition. The roles and responsibilities of the project directors, project managers, and construction managers did change. Next to their 'normal' responsibilities, of managing the project or construction, they need to become the promotors of the coalition for their own company. They need to raise awareness and implement the new ideas and working processes. On team level, the company gets new responsibilities. On the one hand, each company is now responsible for the new completion date. This comes along with new responsibilities towards the client, the managing contractor, and sub-contractors. On the other hand, the companies become responsible for living up to the agreed statements which are included in the joint-declaration statement.

Organizational level

The introduction of the coalition changes the governance structure of the project organization. The traditional hierarchical project structure changes to a network based structure (Figure 15). The principal-agent problem occurs using the traditional organizational project structure. Principal-agent theory is the dependency of the principal (managing contractor) on the agent (sub-contractor) who undertakes a task on the behalf of the principal (Müller & Turner, 2005). During the construction, the sub-contractors do not have the same information as the managing contractor. There is an asymmetry of information provision, which possibly leads to mistrust. However, trust is one of the aspects which should increase.

Müller and Turner (2005) point out that both parties have their own interests and objectives. Communication is a crucial factor to overcome these interpersonal issues and interest misalignment. The principal-agent problems can be overcome by using a network theory approach. "*A network consists of a set of actors or nodes along with a set of ties of a specified type that link them.*" (Borgatti & Halgin, 2011, p. 2). The social network theory incorporates the concept of stakeholder collaboration. The new networked organizations disorder hierarchies, challenge conventional ideas of power and control, and create a need to re-conceptualize management practices (Marchington, Carroll, Grimshaw, Pass, & Rubery, 2009).

Organizational Culture

In line with the social network theory, the coalition stimulates the incorporation of values as collaboration, altruism, and high involvement relationships in the organizational culture. Schein (1996) defines organizational culture as the set of implicit assumptions which are shared by a group that determines how they perceive, think about, and react to their environment. Organizational culture is determined by eight main characteristics which represent most of the dimensions described in qualitative literature (O'Reilly, Chatman, & Caldwell, 1991): innovation (1), stability (2), respect for people (3), outcome orientation (4), attention to detail (5), team orientation (6), aggressiveness (7), and decisiveness (8).

Setting up the coalition tends to affect innovation (1); project team members need to step out their comfort zone and find new ways to collaborate. E.g. contractor A wants to make use of a crane as soon as possible.

Therefore, contractor B needs to wait. However, if contractor B can hoist before contractor A, the overall project durance decreases. Then, the latter option should be followed. This requires coalition members to be inventive. Maintaining the status quo, equal to stability (2), should transform into growth because the overall productivity needs to be increased to meet the agreed deadline. Moreover, outcome orientation (4) should be affected because coalition members should be aware that they are jointly responsible for the outcome. The coalition members are all critical to finish the project. This is incentivized by the use of innovative contracts including a mutual incentive fee. Instead of focusing on individuals, teams are increasingly important. Therefore, team orientation (6) should be affected by the measure.

Table 4 Characteristics Coalition Members

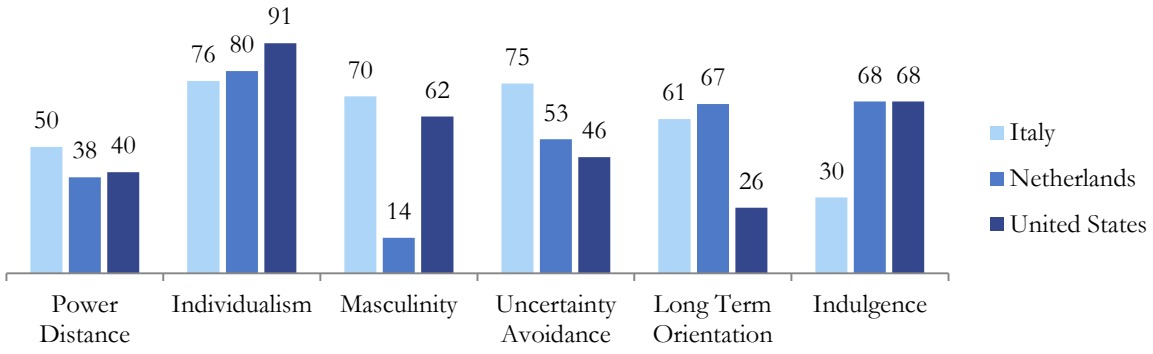
Role	Country of Company	Project Life Cycle
Client	USA/NL	E, P, C
Managing Contractor	USA/NL	E, P, C
Subcontractor 1	NL	C
Subcontractor 2	NL	C
Subcontractor 3	NL	C
Subcontractor 4	IT	C

5.1.2 Coalition Members

The coalition consists of six companies originating from different countries (Table 4). Both the client and the manager contractor are originally American. However, both companies work in the Netherlands for more than 55 years (ExxonMobil, n.d.; Fluor, n.d.). Therefore, it is likely that the Dutch culture is integrated in the company culture as well. So in Table 4, the origin country of the client and managing contractor are defined as both United Stated of America and The Netherlands. Subcontractor 1, 2, and 3 originate from The Netherlands and subcontractor 4 from Italy. The cultural background of the coalition members might affect the attitudes and behavior of coalition members. Table 5 presents six cultural dimensions as stated by Hofstede, Hofstede, & Minkov (2010), and to which extent they are applicable of each of the three countries. This table can be used to assess the differences between the countries which might explain differences in attitude of coalition members. The client and managing contractor have a mix of Dutch and American cultures. This should be taken into account when the dimensions are interpreted. The average of the numbers of both countries is used for the interpretation.

The client and the managing contractor are the actors which are involved in the engineering, procurement, and construction phase of the project. The subcontractors within the coalition joined the project team during the construction phase. The country of the company and the moment the company joined the project, possibly influence the responses on the organizational survey.

Table 5 Cultural Dimensions of Coalition Members – based on (Hofstede et al., 2010)



5.1.3 Coalition Formation Process

Setting up the coalition started in July 2017 and the new contracts were officially signed in January 2018. During this research, the coalition made the transition from norming to performing (Figure 15). The formation followed the five-stage group-development model of forming, storming, norming, performing, and adjourning (Tuckman, 1965) (Figure 16).

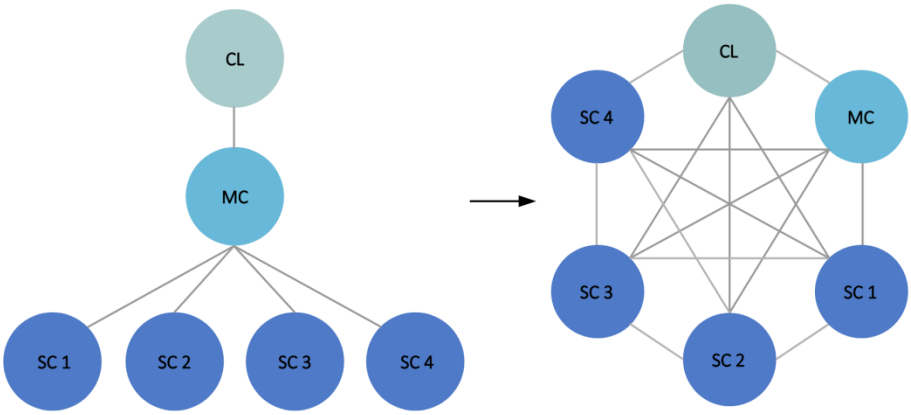


Figure 15 Norming to Performing Stage

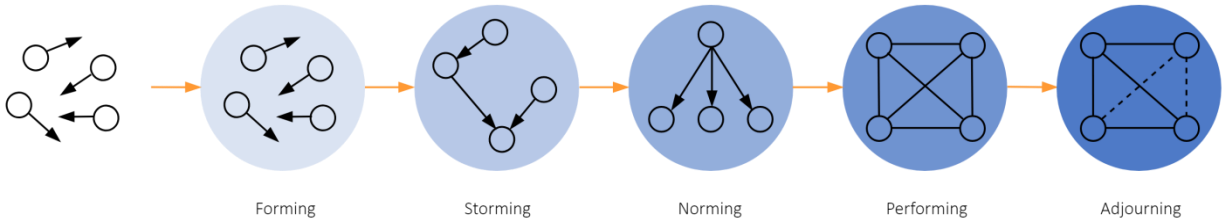


Figure 16 Five Stage Group Development – based on (Robbins & Judge, 2013)

5.2 Coalition and Contractual Structure

5.2.1 Contractual Difference

As part of the coalition the contractual structure is changed. An incentive is added to the old contractual structure which should increase collaboration between the critical actors. The coalition members are seen as one organization responsible for reaching the agreed completion date. If one actor causes a delay, all actors are held responsible. Similar, if the agreed completion date has been met all stakeholders benefit. Furthermore, the contractors are de-risked. Extra expenses due to the formation of the coalition are covered by the client.

As explained in Chapter 3, the RC Sunflower model can be used to analyze the new relational contracting structure as displayed Figure 17. The blue line indicates which components of the model can be related to the coalition. In order to define the intervention as relational contracting, the five core aspects need to be included. Per aspect of the model the difference with the former contractual state is discussed. A short overview of the differences for the client, managing contractor, and subcontractors is given in Table 6.

Figure 17 Coalition RC Sunflower Model

Table 6 Contractual Situation Comparison

Actors	Old	New
CL & MC	Reimbursable	Reimbursable + incentive
MC & SCs	Lump-sum + unit/rate	Lump-sum + unit/rate + incentive + de-risking
Coalition members	-	Incentive

5.2.2 Core Aspects

Commitment

In order to successfully introduce the coalition all parties need to show commitment to strive for the same goal and follow a mutual developed strategy. The first commitment was shown when the members joined the coalition initiation meeting. All members acknowledged the need for an intervention to overcome the problems. This commitment has evolved during the workshops. By means of a financial reward, all coalition members were even stimulated more to deliver the project in time. Moreover, this win-win situation gives leverage to the accountability towards the projects sponsors. The strategy is jointly developed during the workshops and established in the declaration statement.

Trust

Trust is seen as the core element of relational contracting according to multiple academics (Chan et al., 2010; Kumaraswamy et al., 2005; Rahman, Kumaraswamy, & Ling, 2007). The coalition is used as instrument to build up trust between actors. Mutual trust is needed to generate commitment and constructive dialogue between the participating parties (Walker, Hampson, & Peters, 2002). Because trust is based on personal experiences and past experiences, the managing contractor organized workshops for critical actors. Multiple workshops are organized to stimulate cooperation and trust between each other. During the formation

process, the managing contractor emphasized that the benefits of the coalition were reciprocal: it is a basis for long-term relationships and mutual responsibility for obligations.

Cooperation and Communication

The coalition started to stimulate cooperation on all levels within the project organization. Communication is key to reach this objective. Formerly, stakeholders collaborated only when it was necessary. This led to a working environment where people worked on 'islands'. Also, the communication between subcontractors on site was minimal besides they worked on the same construction area. As can be seen in Figure 15, the relationships between subcontractors were minimal and communication mostly went through the managing contractor. This mediating role is logically less efficient than communicating directly with each other. The ties between the client and the subcontractors also were minimal. The coalition challenged this status-quo by increasing moments to directly communicate with each other. Connections between the client, the managing contractor, and subcontractors were shorter. Team events, extra coordination meetings, integrated site walks, and increased promotion for collaboration are used as interventions to improve communication and eventually cooperation. Moreover, the Contractor Reward System stimulates the coalition members to collaborate more and increase communication.

Common Goals and Objectives

Formerly, the goal of the managing contractor was to deliver the project on time, without cost-overrun, and with satisfied stakeholders. This goal was mainly applicable for the client and the managing contractor. Subcontractors were not involved during the first negotiations about the projects. Therefore, they share the urge to reach this goal less than the client and the managing contractor. Only the subcontractor's interest was relevant during the project and leads to certain strategic behavior. This way of working is strengthened by the fact that subcontractors were not obliged to work together. They did not share the same objectives with the client, the managing contractor, and other subcontractors. Relational contracting benefits from defining a mutual goal and jointly developing a strategy. During the initiation of the coalition, the stakeholders were confronted with the problems. They agreed upon the mutual goal to finish the project in July 2018. Together they developed a strategy to reach this objective.

Win-Win Philosophy

A win-win philosophy is at the basis of relational contracting. All relevant stakeholder need to share the win-win philosophy in order to collaborate. Before the coalition formation, there was a win-win philosophy between the client and the managing contractor, and between the managing contractor and each subcontractor. There was no shared philosophy between the client and subcontractors, and subcontractors between themselves because connections between them were limited. With the introduction of the coalition, a win-win philosophy was created which is formalized in the joint declaration statement. Also, the introduced Contractor Reward System and Crafts Recognition Program are based on the principle of the win-win philosophy. The incentives stimulate the project members to act following the win-win principle.

5.2.3 Other Aspects

Formal Contract

The contractual structure of the coalition is different from the former contracts between the client and the managing contractor, and the managing contractor and its subcontractors. The contract between the client and the managing contractor is a reimbursable contract. The contracts between the managing contractor and its subcontractors were lump-sum and unit/rate. With the coalition formation the contracts are modified. A mutual incentive is added for all coalition members. They are jointly incentivized to deliver the project mid July 2018. If the project is delivered at that date the largest bonus will be paid out by the client. In the joint declaration statement the division of the bonus per coalition member is defined. Each day later the bonus will

be reduced till a certain point in time when there is no bonus left. Coalition members are not charged after the break-even point is surpassed (Figure 18). This is in line with the win-win philosophy because all parties can benefit and the client will not lose more than it does without the intervention. Concluding, the former contract is not changed but an incentive is added. Therefore, the formal contract is excluded in this intervention analysis.

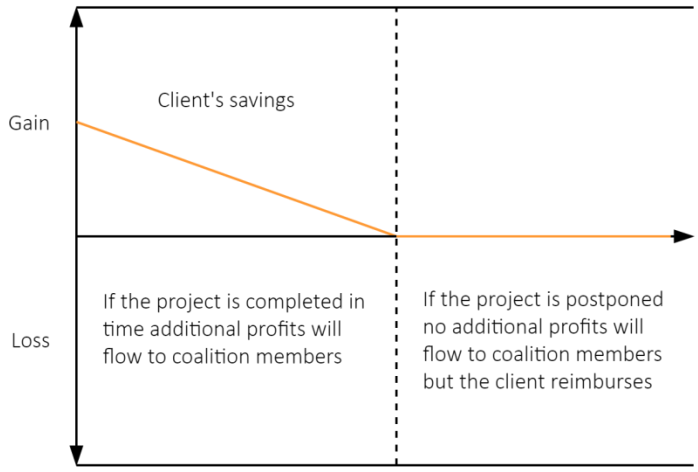


Figure 18 Gain-sharing model – based on (Chan et al., 2010)

Real Gain-share/Pain-share

As can be seen in Figure 18, gains will be shared amongst coalition members. Pain is not shared and still is contributable to the client due to the reimbursable contract with the managing contractor. The agreed profit levels are not placed at risk. Logically, subcontractors would be more hesitant if their pain would also be shared. After all, they already signed a contract. Then, it would be unlikely that this intervention would have taken place. If the gain- and pain-sharing intervention is introduced during the contract formation the impact could be totally different.

Agreed Problem-Resolution Methods

The coalition had a pragmatic approach towards solving problems. In regular meetings disputes are discussed. The coalition should have created an open environment where all coalition members share their problems and concerns. If needed, a suitable solution was conceived and implemented. However, the exact way disputes are resolved is not agreed upon and therefore this aspect is not included in the analysis.

Continuous Improvement

Continuous improvement requires a commitment to learn from experience and apply this knowledge to improve performance (Chan et al., 2010). To obtain this knowledge the performance needs to be measured and analyzed. Since week 49 – 2017, a progress report is made weekly and forwarded to sponsors, directors, managers, and engineers. The dashboard displays the complete construction progress and its prediction. This information is used as input for improvements. In bi-weekly coalition meetings with project sponsors the progress report is discussed. On daily basis, the construction and site managers of the coalition members meet and discuss the progress and challenges.

Facilitated Workshops

Starting from July 2017, multiple workshops are held for the project sponsors of the coalition parties. The purposes of the workshops differed. The managing contractor initiated the formation of the coalition. In week 29 - 2017 the first meeting was held with the client, the managing contractor, and four subcontractors

to create awareness of the problems; without interventions the project will be delivered too late, too expensive, and actors will be dissatisfied. The managing contractor made clear that "*if we do not intervene, the results will be as expected*". The stakeholders acknowledged the need for new interventions and a joint intention statement was signed soon after. There were clear common objectives which steered towards a win-win philosophy.

A team was set up to analyze the problems and come-up with new ideas for improvements. Multiple workshops and events were organized for team building and objective alignment in week 36 - 2017 and week 38 – 2017. This resulted in a redefinition of the turnover package, boundaries, scope, execution optimization, and cost calculation. In week 51 – 2017 the coalition was officially kicked-off with all project sponsors and construction managers. In week 4 – 2018, the joint declaration statement was signed by all stakeholders.

Equity

The interest of all coalition members should be considered in creating common objectives and there should be commitment to take interests of each stakeholder into account (Chan et al., 2010). This is based on the principle of equity and proportionality. Interpreting the definition of the equity strictly, the coalition formation itself is not an equal process. Not all companies are included and are able to negotiate. In addition, the introduced Crafts Recognition Program is only intended for the coalition subcontractors and not the client and the contractor. Nevertheless, one could argue that coalition members are treated equally within the coalition. The organizational structure changed from a hierarchy to a network. During the negotiations, the stakeholders were stimulated to discuss their interests openly during the formation. Because the intervention is implemented during the construction phase of the project most relationships between actors were already constituted. This is emphasized by the fact that the former contract is still in place and only an incentive to collaborate is added.

Joint Declaration Statement

A joint declaration statement consists of multiple statements mentioning mutual objectives to adopt a collaboration approach (Chan et al., 2010). After the first coalition meeting in week 29 – 2017 a joint intention statement was signed by the coalition members. It described the coalition guiding principles:

- Function as One Team with One Brain
- Learning through action with a 24 hour learning cycle
- Acknowledging to do what is best for the project
- Respecting everyone and we are known for collaborative behavior
- Acting fair and reasonable
- Being responsible matters
- Transparency concerning information

These guidelines are the basis of the common goals supported by the coalition members. In week 4 – 2018 all coalition members have signed the declaration statement which elaborates on the details of the coalition. Moreover, the Contractor Reward System is developed.

5.3 Conclusion of Qualitative Analysis

This chapter elaborated on the input for behavioral change. The managing contractor initiated and started a coalition to increase collaboration and thereby accelerate the construction progress. The input was analyzed using the Organizational Behavior Change Model and the RC Sunflower Model developed by Chan et al. (2010). After these analyses, answer can be given to sub-question 1:

Sub-question 1: What is the difference in contractual structure before and after the coalition formation?

The intervention 'the Coalition' consists of seven sub-interventions which are implemented starting July 2017 and formalized by signing the final contract in week 4 – 2018. The coalition consists of the client, the managing contractor, and four subcontractors. First, they signed a joint declaration statement which describes the coalition guiding principles. After this declaration, the formation process of the coalition and the negotiations of the new contract started. This process followed the five-stage group-development model.

The contractual structure changed due to the formation of the coalition. The reimbursable contract between the client and managing contractor and the lump-sum and unit/rate contracts between the managing contractor and the subcontractors are still in place. As part of the coalition formation, an incentive to finish the project mid July 2018 is added for all coalition members. The subcontractors are de-risked for extra expenses due to the coalition formation. The contractual changes can be seen as a shift towards relational contracting. The coalition intervention consists of the five relational contracting core aspects: commitment, trust, cooperation and communication, common goals and communication, and win-win philosophy. In addition, the intervention incorporates continuous improvement, facilitated workshops, real gain-share / pain-share, and a joint declaration statement. As described in scientific literature, relational contracting is positively associated with project performance.

Theoretically, the governance structure changed from a hierarchical structure towards a network structure. Through facilitated workshops, meetings, and events, the coalition members are given the opportunity to increase communication and collaboration. Especially, the relation with the client and subcontractors and between the subcontractors is reinforced.

The interventions give input to change. But the outcome of the input remains unclear. In Chapter 6 and Chapter 7 it is investigated whether actors did change behavior because of the implemented interventions.

6 Organizational Behavior Survey

This chapter discusses the statistical model made from the data obtained by the Organizational Behavior Survey. In section 6.1, the statistical model is discussed. Section 6.2 describes the obtained data and the conducted preliminary data analysis. The respondent profile and suggestions for improvement are elaborated in section 6.3. In section 6.4, the quality of the measurement model is analyzed and discussed. At last, answer is given to sub-question 2 in section 6.5.

6.1 Statistical Model

As explained in section 4.2, the Organizational Behavior Change Model is used to develop the survey. This data is used to create a statistical model. The model represents the obtained data and is used to conduct statistical analysis. The statistical analyses help understanding the developed measurement model (the survey) and results following from the analyses. Eventually, the findings could help to predict the organizational behavior.

6.2 Obtained Data

The obtained data is repeated cross-sectional survey data: a survey is conducted with a new sample of interviewees at successive time points. This differs from longitudinal data where the same sample group is used over the time. Due to the anonymous survey, it is not possible to trace back to the respondents. Multiple issues concerning the acquired data arose during the data screening phase. There are four oddities which can occur: lack or excess of data, outliers, inconsistencies, and unexpected analysis results. To identify suspicious data, a researcher can predefine expectations with corresponding criteria (Van Den Broeck, Cunningham, Eeckels, & Herbst, 2005). Below, the possible oddities and corresponding actions are defined in Table 7.

Table 7 Overcoming Data Problems – based on (Van Den Broeck et al., 2005)

Sources of problem	Action
Form missing	No action possible
Form double, collected repeatedly	Defined as regular data input
Answering option left blank	Defined as missing value
More than one option selected	Defined as missing value
Not readable	Defined as missing value
Writing error	Defined as missing value
Answer given out of range	Defined as missing value

6.2.1 Preliminary Data Analysis

In quantitative research, where data is collected from surveys, preliminary data analysis is needed before the start of the statistical analysis. This preliminary analysis is required to ensure the validity of the subsequent analyses. The preliminary analysis consists of multiple steps which are described below:

- **Screen data**. The raw data needs to be screened on monotone data. Monotone responses are responses which have no variance and therefore have no value for analysis (Yeh, 2009). These responses are excluded from further analysis.
- **Missing values and outliers**. Some data points are defined as missing data in the data sets. There are four ways to handle missing values. The most suitable method depends on the type of statistical analysis that will be performed. In this research missing values are pairwise or listwise deleted.

Pairwise deletion means that missing values are substituted by values which are estimated using other variables (Allison, 2001). Listwise deletion is the default for most statistical software and deletes the complete case if one variable is missing (Allison, 2001). The used approach regarding missing values is mentioned under figures and tables.

Outliers can affect the statistical analyses. It is debatable if the data set of this research has outliers. There is no consensus amongst scientists if Likert scale variables can include outliers. Normally, an outlier is defined as a response which is more than three standard deviations away from the mean. But due to the floor (*strongly disagree* = 1) and ceiling (*strongly agree* = 5) of the used Likert scale, it is imprudent to exclude individuals which have answered within this range. Therefore, no corrections are made for outliers.

- **Normality check**. Because of the large amount of respondents and ordinal data, there is no need for a normality check (Field, 2018). Subsequently, no parametric analyses can be conducted. Therefore, non-parametric analyses are conducted with the obtained data.
- **Reliability and Validity test**. The reliability test analyzes the questionnaire to which extent it measures the variables consistently. This can be analyzed using Cronbach's alpha. Validity implies that the survey measures what it is designed for (Hu, Dinev, Hart, & Cooke, 2012). The validity of the content can be assessed through former researches and pilot testing with domain experts (Straub, Boudreau, & Gefen, 2004).

6.3 Data Results

6.3.1 Respondent Profile

In total 1622 surveys were filled in. In Table 8, the respondent profile is given after the monotone data is deleted. The coalition members handed in the most surveys. They were the main target group and therefore most effort is put in distribution amongst the coalition members. Data retrieved from companies outside the coalition is less valuable because the respondent numbers are very low. The data which cannot be categorized is defined as Other.

Table 8 Respondent Profile. Missing data accounts for differences between sample size and count and percentage

Category	Subcategory	Count	Percentage
Week	50, 51, …, 10, 11	1595	98.3
Company	Client	255	15.7
	Managing Contractor	396	24.4
	Subcontractor 1	395	24.4
	Subcontractor 2	122	7.5
	Subcontractor 3	165	10.2
	Subcontractor 4	143	8.8
	Other	146	9.0
Experience	Short Service	178	11.0
	Safety Mature	1313	80.9

Figure 19 shows the count of the respondents per company per week. Between week 50 – 2017 and week 11 – 2018, the survey is conducted. This graph is based on all obtained data. In general, two different data sets are used to conduct the analysis. On the one hand, analyzing reliability, exploratory factors, and intercompany and experience differences make use of the complete data set as summarized in Figure 19. On the other hand, analyses which are performed to determine differences in time make use of a selection of data: week 50 – 2017 till week 9 – 2018 excluding week 52 – 2017 and week 1 – 2018. These weeks are excluded because of

the low respondent rate due to the Christmas holidays and survey handing out stop. The graph clearly shows an irregular respondent pattern for Other, SC2, and SC4.

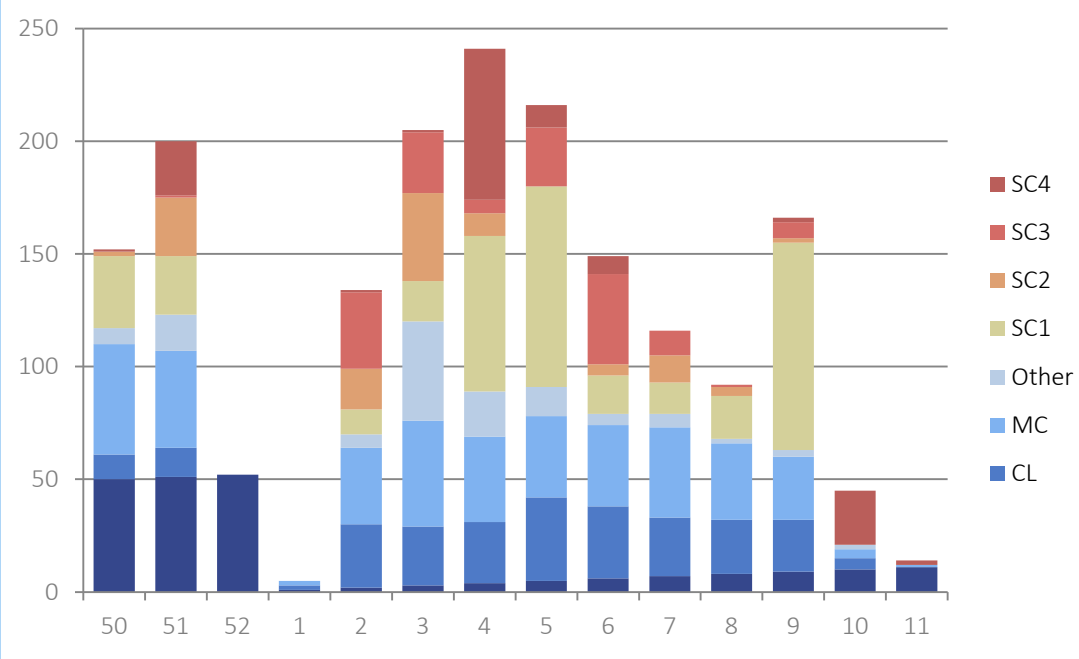


Figure 19 Respondents per Company during Week 50 – Week 11

6.3.2 Suggestions for Improvement

In total, 519 surveys with suggestions for improvements to make the project a success are handed in by the coalition members between week 50 – 2017 and week 11 – 2018. In Figure 20, the percentage of suggestions per retrieved survey per week is given. Over time, the percentage decreases which could be attributed to actual improvements or to survey fatigue (Lavrakas, 2008). On some surveys, multiple suggestions are written down. Every suggestion is counted separately. The data is categorized using descriptive coding (Saldana, 2009). Three First Cycle iterations are conducted to categorize the suggestions of improvements. The areas of improvement are used to help interpret the intercompany, experience, and trend analysis. As can be seen in Figure 19, in total 597 suggestions are given. Miscellaneous areas of improvement concern suggestions which could not be categorized.

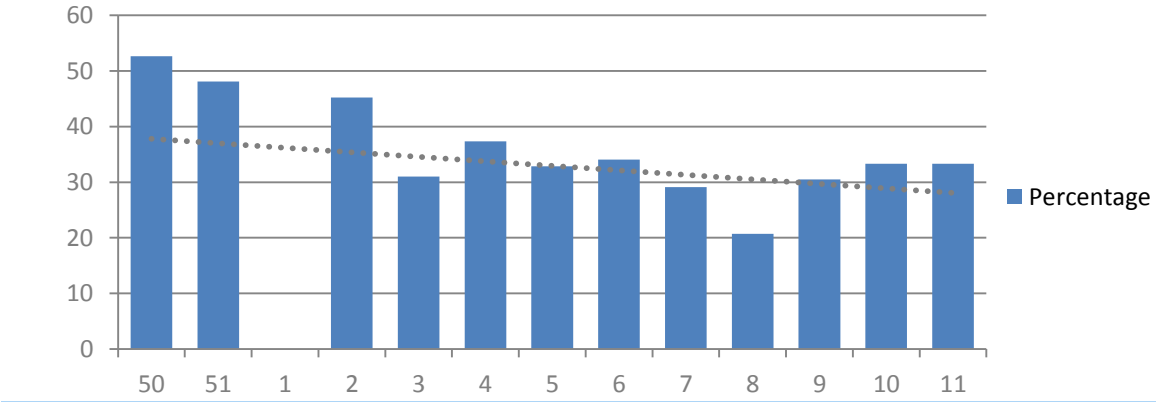


Figure 20 Percentage of Suggestions per Responses per Week

Table 9 Suggestions for Improvement of Coalition Members (N = 523)

Area of Improvement	CL	MC	SC1	SC2	SC3	SC4	Total
Communication	35	42	58	14	20	8	177
Coordination	21	22	7	11	11	15	87
Facilities	4	12	19	4	29	10	78
Collaboration	13	19	12	12	6	12	74
Miscellaneous	10	15	12	6	8	12	63
Transport	2	0	32	0	0	4	38
Attitude	9	14	0	1	3	10	37
Reward	2	6	1	0	2	5	16
Safety	4	1	1	0	0	7	13
Respect	0	2	2	1	0	2	7
Working time	1	0	3	0	0	3	7
Total	101	133	147	49	79	88	597

The most suggestions for improvement concern communication (177/597) and coordination (87/597) (Table 9). Both categories relate to the organizational aspects of Communication and Leadership. All coalition members give suggestions for improvement in these areas. More specifically, 15 suggestions explicitly state that there is a need for clear communication about the coalition to project personnel. Not all personnel understand what the coalition is and does. This is in line with the findings in the literature study in Chapter 3 concerning organizational change. Communication about the organizational change is required to overcome resistance to change (Kotter & Schlesinger, 2008).

6.4 Quality of Measurement Model

The fit of the model is the degree to which the statistical model represents the obtained data. The better the fit, the more reliable the findings and conclusions are. Assessment of the quality of the measurement model is a critical step to start analysis and draw conclusions. The quality of a measurement model can be assessed on content validity, construct validity, and reliability (Straub et al., 2004). Below the content validity and reliability are discussed. The construct validity is determined using the exploratory factor analysis described in paragraph 0.

6.4.1 Content Validity

Content validity is defined as the degree to which individual questions represent the construct being measured and cover the full range of the full construct. It is usually assessed by experts and through scientific literature review (Straub et al., 2004). In this research, the questions are derived from the Organizational Behavior Change Model which is based on scientific literature. In addition, the questions and related variables are assessed by multiple experts.

6.4.2 Reliability

The reliability of the questionnaire refers to how well the variables correlate or move together. Reliability can be assessed by the Cronbach's alpha indicator. Cronbach's alpha is a statistic measuring internal consistency (Cronbach, 1951). Psychometric research which has an internal consistency larger than 0.7 is considered 'good' (Taber, 2017). Numbers which are higher than 0.45, are 'acceptable' or 'sufficient'. However, there is no uniform definition of these ranking criteria (Field, 2018; Taber, 2017). The Cronbach's Alpha of this statistical model is 0.748 (Table 10). This means that the internal consistency is good.

Table 10 Cronbach's Alpha (N=1524) (Listwise deletion)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.748	.766	12

6.4.3 Reverse Coding

Variables which correlate negatively with the corrected item-total correlation need to be reverse coded (Pallant, 2007). Negative values could indicate that the item is not measuring the underlying construct. Table 11 shows the item-total statistics of the final model. Reverse coding leads to a higher Cronbach's alpha (Field, 2018). Three questions are reverse-coded because they negatively correlate with the scale: Q2, Q4 and Q6. See Appendix E for further explanation of the reverse-coding procedure. Reverse coding affects the internal consistency of the model but is hard to quantify (Colosi, 2000). Therefore, the assumption is made that the effect of the reverse coding is negligible. Reverse-coding should be taken into account during the interpretation of the reversed items. It is logical that Q2 and Q6 need to be reverse-coded because the phrases are contrary constructed. Analyzing the phrase of Q4, there is no clear indication why it needs to be reverse-coded. The Corrected Item-Total Correlation is very small (-0.015). For all we know, the correlation could have been positive too due to measurement errors for example. Therefore, this question will not be reversely interpreted in the statistical analysis.

Table 11 Item-Total Statistics (Listwise deletion)

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	39.21	28.431	.573	.423	.712
Q2_R	40.17	29.421	.312	.145	.740
Q3	39.25	29.533	.447	.327	.725
Q4_R	40.83	32.337	.015	.047	.782
Q5	40.17	26.869	.517	.403	.712
Q6_R	39.52	31.620	.104	.142	.765
Q7	39.29	28.963	.503	.371	.719
Q8	38.93	29.922	.457	.346	.726
Q9	39.37	30.607	.300	.165	.740
Q10	40.29	26.568	.502	.410	.714
Q11	39.60	26.748	.550	.411	.708
Q12	40.05	27.837	.531	.412	.713

The corrected item-total correlation shows the correlations between each item and the total score of the questionnaire. Scores lower than 0.3 indicate that the item does not measure the underlying construct very well (Field, 2018). Table 11 shows that Q4 (0.015) and Q6 (0.104) have the lowest correlation with the total scale. These items are excluded stepwise, starting Q4 with lowest score (Appendix F). Eventually, Q2 needs to be removed too. So, the reversed questions need to be excluded from the statistical model. Then, the Cronbach's alpha of the new statistical model would be even higher: 0.815. So, a model excluding questions Q2, Q4, and Q6 constructs a more reliable statistical model. The current model including all items has a good internal consistency as mentioned earlier. No adaptions to the model will be made because otherwise data concerning different aspects will be lost. Therefore, the same construct will be used in the factor analysis.

Table 12 Variable Mean, Standard Deviation, and Correlations. (Listwise deletion)

	Mean	SD	Q1	Q2_R	Q3	Q4	Q5	Q6_R	Q7	Q8	Q9	Q10	Q11	Q12
Q1	4.127	.782	**1.000**											
Q2_R	3.164	1.003	.264	**1.000**										
Q3	4.079	.762	.412	.185	**1.000**									
Q4_R	3.495	1.135	.003	.090	-.024	**1.000**								
Q5	3.167	1.080	.353	.200	.199	.015	**1.000**							
Q6_R	3.816	1.011	.110	.205	.230	.154	-.072	**1.000**						
Q7	4.043	.784	.529	.173	.248	.010	.337	.015	**1.000**					
Q8	4.406	.686	.382	.169	.459	-.077	.223	.140	.376	**1.000**				
Q9	3.966	.784	.212	.079	.304	-.069	.165	.067	.152	.338	**1.000**			
Q10	3.041	1.148	.315	.162	.189	-.001	.497	-.065	.371	.204	.196	**1.000**		
Q11	3.736	1.050	.424	.113	.287	-.020	.523	-.002	.394	.352	.227	.448	**1.000**	
Q12	3.284	.918	.363	.221	.258	-.044	.478	-.069	.353	.239	.218	.553	.432	**1.000**

6.4.4 Factor Analysis

In Table 12, the correlations between each pair of variables are given. Factor analysis is a method to reduce the correlation matrix into a smaller set of dimensions. Factor analysis tries to explain the maximum amount of common variance of variables using the smallest number of exploratory factors. The factors are constructs which represent variables which correlate highly with each other. The determined factors reflect constructs which cannot be measured (Field, 2018). Determining these factors help to interpret the results and the relations between questions and its underlying aspects.

Before the factor analysis, there are multiple checks which need to be conducted. The first test concerns the sample size which needs to be greater than 500 in order to being able to ignore low communalities. This criterion is obviously met (1524 valid data entries) and even after testing for communalities the criteria are met. The other tests concern correlations between variables, factor extraction, and factor rotation. The checks are explained in Appendix G.

6.4.5 Factor Interpretation

Three factors can be extracted which in combination explain 54.24% of the variance (Table 13). This is in accordance with the rule of Streiner (1994) which states that cumulative variance should be more than 50% of the total variance. To optimally interpret the factors, the matrix is orthogonally rotated (varimax). According to Field (2018), factors which load less than 0.4 on the factor should be suppressed and not assigned to a factor. Following this criterion, only Q1 loads on two factors: factor 1 and 2. This means that this variable reflects related constructs or it is an inappropriate factor to distinguish the factor. Therefore, it is excluded from the interpretation.

Table 13 Summary of Exploratory Factor Analysis (N=1524) (Listwise deletion)

		Rotated Component Matrix*		
		Factors		
	Question	1. Reflection on project	2. Collaborative attitude	3. Miscellaneous
Q10	This project will be completed in time	**.779**	.053	.000
Q5	Changes in work processes are communicated clearly	**.776**	.057	.046
Q12	Compared to last week, I am more positive about this project	**.748**	.145	-.001
Q11	I feel part of one project team	**.681**	.290	-.008
Q7	I am satisfied with my contribution to this project	**.563**	.328	.131
Q8	Working together helps this project	.217	**.746**	.044
Q3	I like to work together with people from other companies	.155	**.727**	.190
Q9	I am open to change my way of working	.132	**.616**	-.142
Q4_R	I work harder when I get rewarded	.041	-.297	.683
Q6_R	I see people from other companies as competitors	-.252	.344	.648
Q2_R	I experience much stress during my work	.241	.137	.585
Q1	I enjoy doing my job	.498	.477	.241
Eigen values		3.82	1.49	1.20
% of variance		31.87	12.41	9.96
α		.794	.627	.337

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. *. Rotation converged in 5 iterations.

- The first factor is the most reliable extracted factor (Cronbach's α = 0.794) and contributes the most to the total variance (31.87%). It clusters items that concerns employees' reflection on the project. Respondents assess the project itself, their stance, and their contribution.
- The second factor is moderately reliable (Cronbach's α = 0.627) and accounts for 12.41% of the total variance. It represents the collaborative attitude of employees. The importance of collaboration is tested and if people are willing to change.
- The third factor is unreliable (Cronbach's α = 0.337) and accounts for 9.96% of the total variance. Due to the low reliability and minor effect on the total variance, this factor hardly measures an underlying construct. This means that the items measure separate constructs. As can be seen in Table 2, they relate to separate organizational behavior aspects: Q2 – Stress, Q4 – Motivation, and Q6 – Perception & Group Functioning. These are all different aspects and need to be interpreted separately.

6.5 Conclusion

This chapter elaborated on the Organizational Behavior Survey to measure behavioral change. In combination with Chapter 4, sub-question 2 can be answered:

Sub-question 2: How can organizational behavior be measured?

The Organizational Behavior Survey is developed to measure the attitude of project members towards multiple individual and group aspects of organizational behavior. The survey questions are developed based on the Organizational Behavior Change Model as shown in Figure 11. This model combines relevant scientific theories concerning organizational change and organizational behavior in the construction industry. The data derived from the questions targeting individual aspects make it possible to interpret people's attitude

towards emotion, stress, motivation, task performance, perception, and collaboration. In addition, the data derived from the questions targeting group aspects make it possible to interpret people's attitude towards communication, leadership, trust, group functioning, and group cohesion. The survey measures qualitative and quantitative data. The quantitative data can be used to create a statistical model which is used to conduct multiple analyses. The survey questions are answered on a 5-point Likert scale. The qualitative data can be used to support the quantitative findings.

The data was collected through a case study at the RAHC project. All project members were weekly targeted as sample size. The main focus of this research is laid on the coalition members. In total 1622 filled in surveys were collected between week 50 – 2017 and week 11 – 2018. After preliminary data analysis, 1595 data entries remained and are used for statistical analyses. This analysis showed that non-parametric tests need to be conducted because the data is not normally distributed and the sample size is larger than 500. The obtained data can be defined repeated as cross-sectional survey data.

The quality of the measurement model is determined by the content validity, construct validity, and reliability. The survey questions are based on the scientific literature and are reviewed by experts to maximize content validity. The reliability of the measurement model is good (Cronbach's $\alpha = 0.748$). The construct validity is measured by the factor analysis. The model measures three underlying constructs: reflection on project (Cronbach's $\alpha = 0.794$), collaborative attitude (Cronbach's $\alpha = 0.627$), and miscellaneous (Cronbach's $\alpha = 0.337$). The latter construct hardly measures an underlying construct and therefor these items will be interpreted separately in subsequent analyses.

So, the developed statistical model is reliable and has tested validity. In the next chapter, the statistical model is used to analyze the differences between companies, between unexperienced and experienced employees, and between weeks per company.

7 DATA ANALYSIS

In this chapter, the obtained survey data is analyzed and interpreted. In section 7.1, the differences in responses to the Organizational Behavior Survey from coalition companies are analyzed. The differences are analyzed using all data entries; no corrections are made for missing values. Section 7.2 discusses the differences in responses to the survey between experienced and unexperienced project members. In section 7.3, the responses of the coalition members to the survey are analyzed over time. The data obtained between week 50 – 2017 and week 9 – 2018 is used for these analyses. Week 52 – 2017 and week 1 – 2018 are excluded due to a low response rate. Section 7.4 describes the results of the Gallup survey. At last, the conclusions are drawn in section 7.5.

7.1 Intercompany Analysis

The obtained data is not normally distributed and therefore a non-parametric analysis needs to be conducted (Field, 2018). The Kruskal-Wallis test can be used to compare two or more groups with an ordinal or continuous dependent variable, to determine if there are significant differences (Field, 2018). This test can be performed even when the sample sizes of the groups differ. So, this is a suitable analysis method to discover significant differences between coalition companies.

Table 14 Kruskal-Wallis test per Company

Independent-Samples Kruskal-Wallis test

Null Hypothesis	Sig.	Decision
The distribution of Q1 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q2 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q3 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q4 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q5 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q6 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q7 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q8 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q9 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q10 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q11 is the same across categories of Company.	.000	Reject the null hypothesis.
The distribution of Q12 is the same across categories of Company.	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is 0.050

For the intercompany analysis all data entries from the coalition companies are used. The Kruskal-Wallis test is conducted to determine if groups come from different populations concerning a certain dependent variable (Field, 2018). It tests whether there is a significant distribution difference between the groups concerning one question. If so, the test turns out to be significant and the null hypothesis should be rejected. Table 14 shows that all null hypothesis need to be rejected. So, there are significant distribution differences between companies concerning all questions and corresponding aspects. However, this does not tell which groups differ. This is analyzed by performing a pairwise comparison of the company results. The response distribution of each company is compared to the response distribution of all other companies.

To assess the differences between companies, a similar null hypothesis is constructed: *the distribution of Q.. is the same across Company .. and Company .. .* The significance level is 0.05. If the tests turn out to be significant,

there is a difference between Company *X* and Company *Y*. Testing for significance stimulates thinking in black and white. Non-significant results such as $p = 0.053$ (MC-SC3, Q9) are excluded. This data is useful to calculate the effect sizes. Determining the effect size is a method to quantify the difference between two groups. The effect is calculated and interpreted using the equation [1], where r denotes the Pearson correlation coefficient, z represents the z-score, and N is the number of data entries (Field, 2018; Rosenthal, 1991).

$$r = \frac{z}{\sqrt{N}} \quad [1]$$

- $r = 0.10$ (small effect): the effect explains 1% of the total variance
- $r = 0.30$ (medium effect): the effect explains 9% of the total variance
- $r = 0.50$ (large effect): the effect explains 25% of the total variance

Table 15 Differences between Companies

	Q5	Q11	Q12	Q1	Q10	Q3	Q7	Q8	Q6	Q9	Q4	Q2	Dif. points
Number of cases	1442	1441	1440	1447	1435	1444	1440	1443	1446	1438	1444	1446	
MC – SC4	.278*	.211*	.245*	.173*	.235*	.076	.164*	.072	.118*	.116*	.090*	.076	12
CL – SC4	.221*	.149*	.231*	.106*	.145*	.117*	.121*	.003	.108*	.121*	.084*	.062	11
SC3 – SC4	.191*	.217*	.215*	.202*	.239*	.084*	.089*	.161*	.011	.035	.018	.073	10
MC – SC1	.302*	.328*	.162*	.151*	.143*	.016	.182*	.025	.078*	.011	.051	.092*	10
SC1 – SC3	.175*	.295*	.132*	.183*	.157*	.170*	.076	.143*	.050	.085*	.075	.080*	8
SC2 – SC4	.131*	.116*	.193*	.192*	.164*	.004	.176*	.101*	.024	.093*	.043	.066	7
CL – SC3	.009	.095*	.007	.122*	.124*	.216*	.023	.187*	.098*	.085*	.106*	.019	6
CL – SC1	.218*	.228*	.146*	.062	.029	.073	.119*	.068	.065	.007	.045	.070	6
SC1 – SC2	.103*	.164*	.110*	.170*	.071	.066	.179*	.070	.030	.006	.002	.070	5
MC – SC3	.052	.049	.010	.070	.050	.182*	.060	.124*	.109*	.077	.114*	.011	4
CL – SC2	.062	.012	.002	.115*	.046	.116*	.082*	.116*	.075	.011	.031	.015	3
SC1 – SC4	.057	.028	.127*	.062	.132*	.064*	.032	.053	.061	.124*	.052	.009	3
MC – SC2	.104*	.061	.001	.066	.026	.077*	.055	.053	.083*	.002	.033	.007	1
SC2 – SC3	.049	.090*	.008	.002	.061	.076	.094*	.051	.014	.062	.060	.002	0
CL – MC	.050	.063	.002	.073	.098*	.059	.042	.091*	.004	.017	.000	.012	0
Dif. points	14	14	12	10	10	6	6	6	3	3	2	0	

*Values which are significantly different. p = 0.05

Table 15 shows the differences between companies and how large these differences are. The ranking of small, medium, and large effects is little refined. To help understanding the presented results, a score is given to the effects (*Dif. points*):1 point if $0.2 \leq r \leq 0.1$ (light-blue), 2 points if $0.3 \leq r \leq 0.2$ (blue), 3 points $r \geq 0.3$ (dark-blue).

7.1.1 Interpretation Intercompany Analysis

To interpret the results correctly, the findings need to be related to the mean values per aspect per company (Table 16). The results are compared with the unweighted averages of the question per company. Red highlighted results have a value below the average. Blue highlighted results have a value above the average. This table is only used to understand the direction coefficient of the differences.

Table 16 Averages per Aspect per Company

Factor	Reflection on project					Collaborative attitude						
Question	Q10	Q5	Q12	Q11	Q7	Q8	Q3	Q9	Q4	Q6_R	Q2_R	Q1
CL	3.16	2.93	3.14	3.60	3.97	4.57	4.29	4.06	3.68	3.97	3.12	4.17
MC	2.79	2.75	3.13	3.36	3.88	4.35	4.17	4.02	3.65	4.00	3.09	4.02
SC 1	3.24	3.61	3.51	4.27	4.24	4.43	4.11	3.96	3.45	3.71	3.29	4.30
SC 2	2.92	3.18	3.10	3.65	3.69	4.21	3.95	4.03	3.53	3.71	3.03	3.79
SC 3	2.59	2.95	3.08	3.22	4.07	4.10	3.65	3.80	3.18	3.67	3.06	3.78
SC 4	3.79	3.84	3.91	4.14	4.28	4.52	3.89	3.58	3.21	3.50	3.33	4.41
Unweighted Average	3.05	3.16	3.29	3.73	4.03	4.39	4.08	3.95	3.52	3.81	3.16	4.11

The interpretation of the results leads to the following findings:

- Companies hardly differ in their responses to Q2 – Stress, Q4 –Motivation, Q6 – Perception & Group Functioning, and Q9 – Attitude.
- Companies moderately differ in their responses to Q3 – Attitude & Group Functioning, Q7 – Emotion & Task Performance, and Q8 – Synergy.
- Companies strongly differ in the responses to Q5 – Communication & Leadership, Q11 – Group Cohesion, Q12 – Perception, Q1 – Emotion, and Q10 – Trust.

7.1.2 Relationship between Actors

The new organizational structure created and intensified the relations between client and subcontractors, and subcontractors between each other (Figure 15). Therefore, it is useful to analyze the relationships between the actors. Table 17 presents the amount and the size of differences between the actors.

Table 17 Amount of Differences between Actors

	CL	MC	SC 1	SC 2	SC 3	SC 4	Total
CL	-	0	6	3	6	11	26
MC	0	-	10	1	4	12	27
SC 1	6	10	-	5	8	3	32
SC 2	3	1	5	-	0	7	16
SC 3	6	4	8	0	-	10	28
SC 4	11	12	3	7	10	-	43

Client and managing contractor

The attitudes of both the client and the managing contractor differ hardly. All differences account for less than 1% of the total variance. The client and managing contractor have two things in common which could explain the similar responses (Table 4). First, both companies have an American and Dutch background. Second, the client and managing contractor collaborated since the start of the project. Both actors were involved in the engineering, procurement, and construction phase. This indicates that working together for a long time aligns attitudes towards the organizational behavior aspects.

Client and subcontractors

Since the coalition intervention, contact between the client and subcontractors was limited. Due to the coalition, the client is in daily contact with the subcontractors. This means that the relation between the client

and the subcontractors becomes more important. The client has many differences in attitude with SC4, some difference with SC1 and SC3, and a few differences with SC2.

The cultural differences between the client and SC4 could be an explanation of the differences. SC4 is an Italian company whereas other companies are American or/and Dutch. The Italian culture differs from the American and Dutch culture concerning uncertainty avoidance(Hofstede, Hofstede, & Minkov, 2010). Uncertainty avoidance states to which extent the members of the culture are threatened by ambiguous and unknown situations. This is supported by the above average scores of SC4 concerning project reflection (Table 16). Reflecting on the project negatively could threaten their position as subcontractor. The differences with SC1, SC2, and SC3 are limited. The similar culture might explain the absence of differences.

Managing contractor and subcontractor

The attitudes of the managing contractor and subcontractors are diverse. The managing contractor differs strongly with SC3 and SC4 and shows small differences with SC1 and SC2. Again, the cultural differences between the managing contractor and SC4 could be the explanation of the differences. The managing contractor shows large differences with SC3 concerning Q5 – Leadership & Communication and Q11 – Group Cohesion. The attitude of SC3 towards Communication & Leadership is more positive than the attitude of the client (3.61>2.75). This is remarkable because 58 of the 147 the suggestions for improvement concern communication and leadership. Confounding data could be an explanation for these contrary findings. In addition, SC3 scores above average concerning project reflection (Table 16). The differences between the managing contractor and SC1 and SC2 are limited. The similar culture might explain the absence of differences.

7.2 Experience Analysis

To analyze the differences of respondents caused by experience, the Kruskal-Wallis test is conducted again. Experience is divided in Short Service (SS) and Safety Mature (SM). SS means that the employee did not obtain a certain safety maturity level. After six weeks an employee is allowed to take the safety test and become SM. Also, the effect of the differences is calculated in the same manner. In Table 18, the results of the experience analysis are given. Table 19 helps interpreting the results.

Table 18 Results of Experience Analysis

Question	Significance	Total N	Test Statistic	Effect
Q4 – Motivation	0.002	1309	9.841	0.272
Q12 – Perception	0.012	1309	6.301	0.174
Q6_R – Perception & Group Functioning	0.015	1312	5.925	0.164
Q11 – Group Cohesion	0.018	1310	5.580	0.154
Q5 – Communication & Leadership	0.023	1310	5.166	0.143
Q8 – Synergy	0.063	1311	3.459	0.096
Q1 – Emotion	0.073	1313	3.205	0.088

Table 19 Averages based on Experience

Factor	**Reflection on project**					**Collaborative attitude**						
Questions	**Q10**	**Q5**	**Q12**	**Q11**	**Q7**	**Q8**	**Q3**	**Q9**	**Q6_R**	**Q4**	**Q2_R**	**Q1**
SS	3.03	3.12	3.26	3.69	4.06	4.42	4.09	3.95	3.84	3.48	3.17	4.13
SM	3.16	3.39	3.48	3.93	3.98	4.34	4.01	4.00	3.62	3.75	3.11	4.02

The interpretation of the results leads to the following findings:

- There are significant differences between employees who are Short Service and employees who are Safety Mature regarding Q4 – Motivation, Q12 – Perception, Q6 – Perception & Group Functioning, Q11 – Group Cohesion, Q5 – Communication & Leadership, Q8 – Synergy, and Q1 – Emotion.
- There are no significant differences between employees who are Short Service and employees who are Safety Mature regarding Q2 – Stress, Q3 – Attitude & Group Functioning, Q7 – Emotion & Task Performance, Q9 – Attitude, and Q10 – Trust.
- The largest significant difference concerns Q4 – Motivation (r = 0.272). On average, Safety Mature employees agree more with the statement 'I work harder when they get rewarded' than Short Service employees. Possibly, the employees who just started at the project are more excited and motivated by the job itself than by financial rewards.

7.2.1 Company and Experience

The company of the respondent causes more significant differences in responses than the experience of the respondent. There are more significant differences concerning the organizational behavior aspects based on the company of the respondent than the experience of the respondent. The experience of a respondent has impact on the attitude of employees regarding motivation. The comparison of companies shows significant differences in attitude concerning communication & leadership, group cohesion, perception, emotion, and trust.

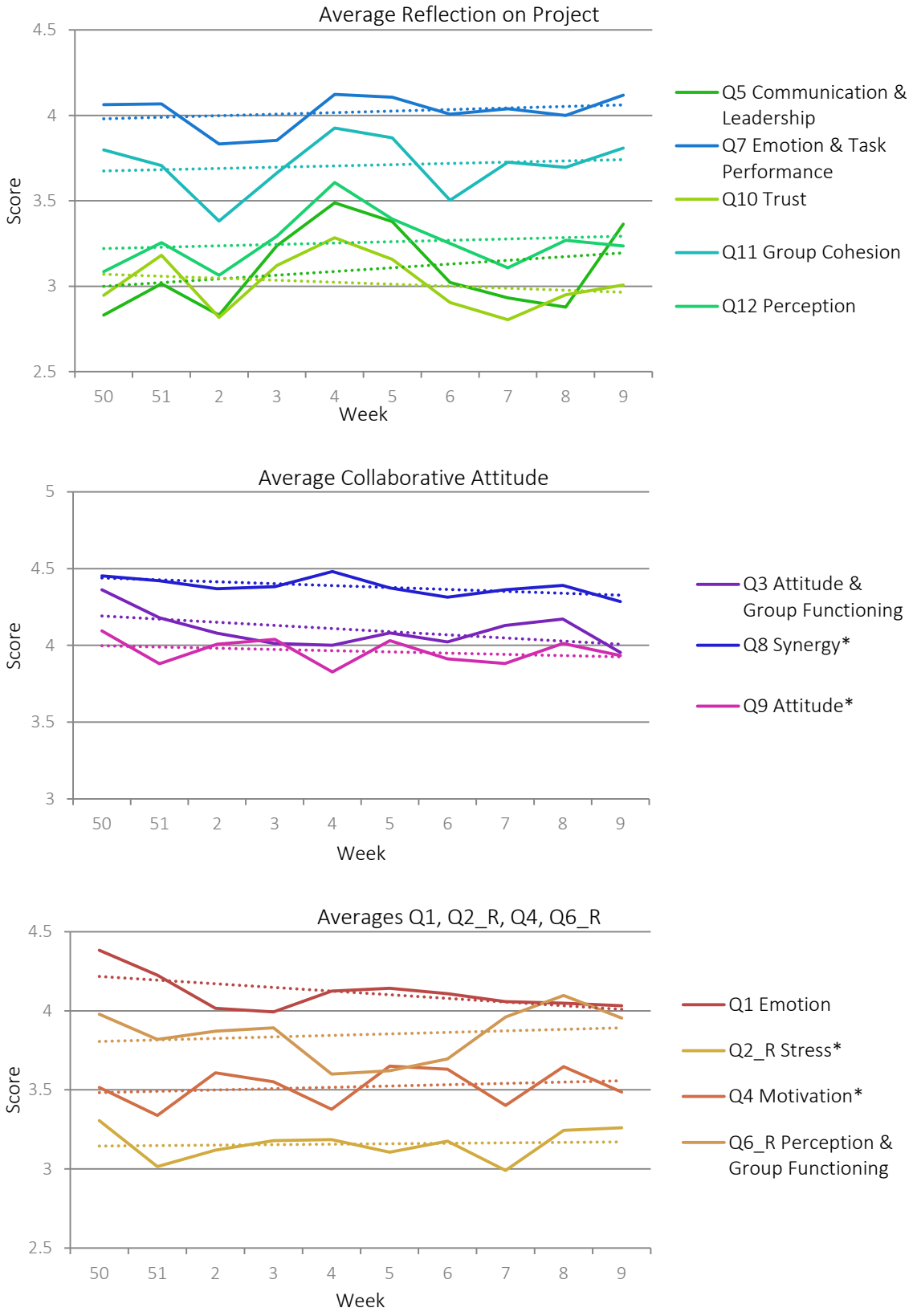
7.3 Trend Analysis

7.3.1 Attitude of Coalition

For the trend analysis, all data entries from the coalition companies between weeks 50 – 2017 and week 9 – 2018 are used. The objective of this analysis is to determine if there are significant changes in responses over time. The Kruskal-Wallis test is conducted to tests whether there is a significant distribution difference between the weeks concerning one question (Field, 2018). If so, the test turns out to be significant and the null hypothesis should be rejected. Appendix HAppendix shows that the null hypothesis of Q1, Q3, Q5, Q6, Q7, Q10, Q11, and Q12 needs to be rejected. So, there are significant differences between the weeks concerning these questions. The questions Q2, Q4, Q8, and Q9 do not significantly differ. This means that either not enough data was retrieved to conduct an appropriate analysis or the distributions are similar.

The graphs in Figure 21 show the average scores of the question responses per week and the trend line per question. The number of respondents per week can be found in Figure 19. In general, the shape of the graph lines is similar to the shape of the amount of respondents per week. Possibly, this is caused by the effect of the different number of responses per company per week.

Figure 21 Averages per Week per Question. * = non-significant differences (p = 0.10)



Positive trends

Since the coalition introduction, the coalition members reflected more positive on the project. The aspects communication and leadership showed the steepest positive increase. Also, they felt more part of one team, saw other companies less as competitors, and were more satisfied about their performance. Possibly, this is caused by the reinforced relations between actors stimulated by team building events, extra coordination meetings, integrated site walks, and promotion (**Error! Reference source not found.**). The reinforced relations offered opportunities for coalition members to collaborate and conduct their jobs better. The majority of suggestions for improvement concern communication and leadership. Possibly, the interventions foresaw in the needs of improved communication and leadership..

Negative trends

During the coalition, the coalition members showed a significant decrease in emotion, trust, and attitude towards group functioning. They showed less trust in completing the project in time and enjoyed working together with other companies less. Moreover, the enjoyment of doing the job decreased over time. The newness of the intervention could have played a role in the decrease. The managing contractor needed to sell their idea and tried to actively involve and motivate other companies to enter the coalition. People reacted positively but the excitement decreased over time. In addition, the network structure could have led to the negative trend. The relation between the client and subcontractors and the subcontractor between each other intensified. Coalition members are therefore directly confronted with all problems and challenges discussed in meetings and events. This transparent environment might lead to the confronting and unsatisfying truth.

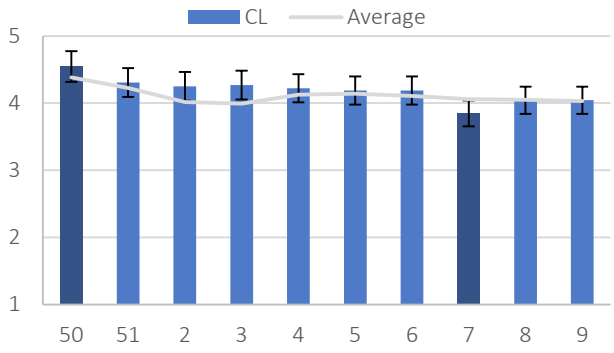
Similar trends

No significant differences were observed in synergy. The attitude of coalition members towards synergy, working together helps this project, remained the same. The average respondent score of the coalition members was 4.39 out of 5.00 concerning synergy. This finding indicates that the coalition members already acknowledge the importance of collaboration and this remained the same since the coalition start. In addition, the attitude changing way of working did not change significantly. Actually, this aspect is part of someone's personality. It reflects the flexibility someone. As elaborated in Chapter 3, it is unlikely that someone's personality changes. Furthermore, the stress of the coalition members did not change significantly. The interventions might not have affected people's stress feelings. At last, people's attitude towards rewards stimulating to work harder did not change significantly. Possibly, the introduced contractor reward system for the coalition members and crafts recognition program for coalition subcontractors did not have had an effect on people's motivation to work hard.

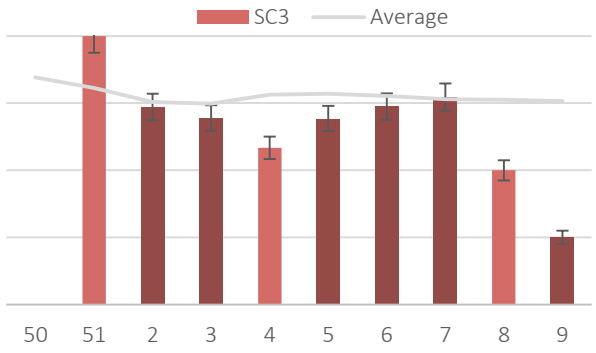
7.3.2 Attitude per Coalition Member

Pairwise comparison of the weeks needs to be conducted to analyze the responses per week per company. The response distribution of each week is compared to the response distribution of all other weeks (see Appendix I for the effects). Below, all significant differences ($p = 0.1$) between the weeks per company per question are given. This means that all other companies and questions which are not included in the description below do not significant differ over the weeks. So, there is no significant change or a lack of retrieved data. In some graphs, no stack bars are displayed due to absence of data of that week of the company.

Q1 Emotion

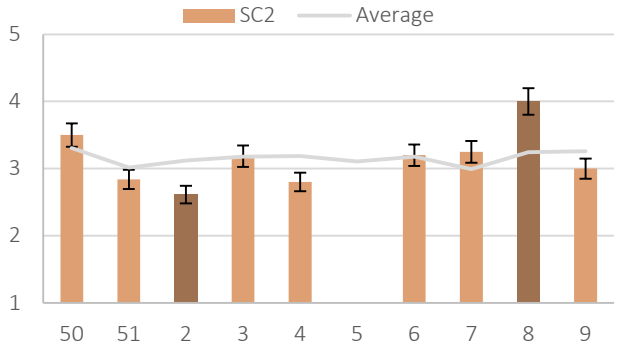


CL	Week 50 – Week 7	*r* = .223	*p* = .020

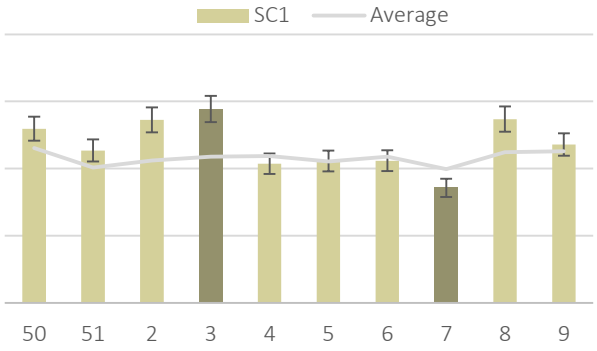


SC3	Week 2 – Week 9	*r* = .294	*p* = .008
	Week 3 – Week 9	*r* = .242	*p* = .100
	Week 5 – Week 9	*r* = .244	*p* = .091
	Week 6 – Week 9	*r* = .301	*p* = .007
	Week 7 – Week 9	*r* = .295	*p* = .010

Q2_R Stress

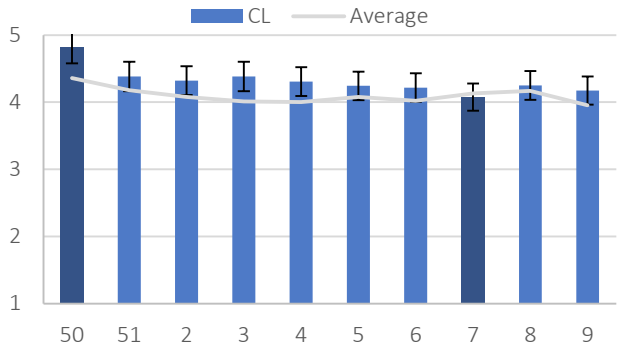


SC2	Week 2 – Week 8	*r* = .289	*p* = .066

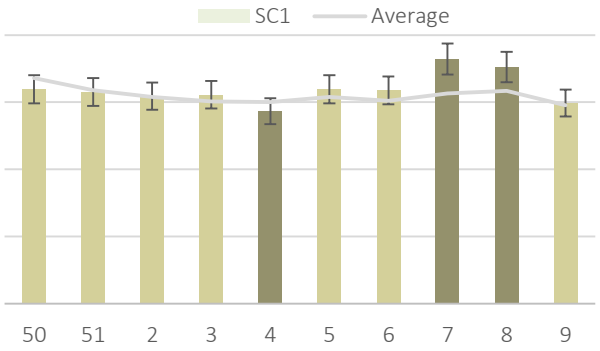


SC1	Week 3 – Week 7	*r* = .162	*p* = .064

Q3 Attitude & Group Functioning

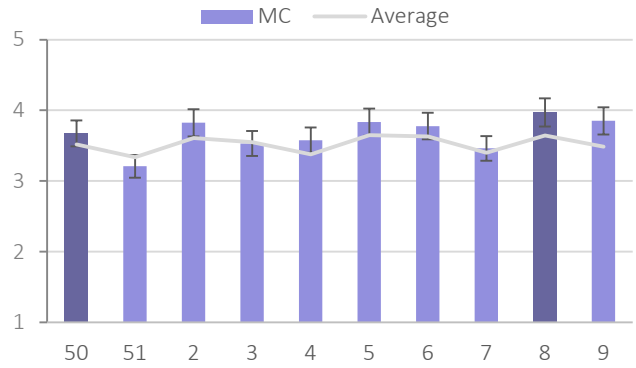


CL	Week 50 – Week 7	*r* = .236	*p* = .010



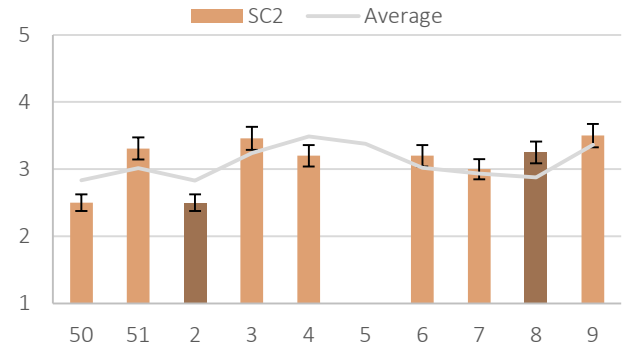
SC1	Week 4 – Week 7	*r* = .184	*p* = .014
	Week 4 – Week 8	*r* = .174	*p* = .029

Q4 Motivation

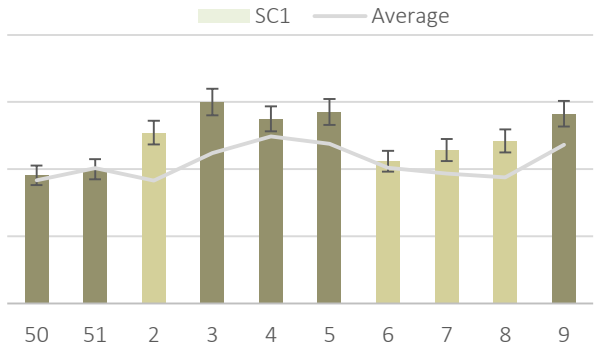


MC	Week 50 – Week 8	*r* = .171	*p* = .037

Q5 Communication & Leadership

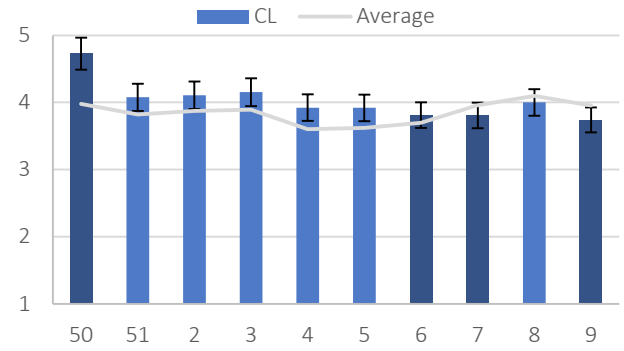


SC2	Week 2 – Week 3	*r* = .325	*p* = .017

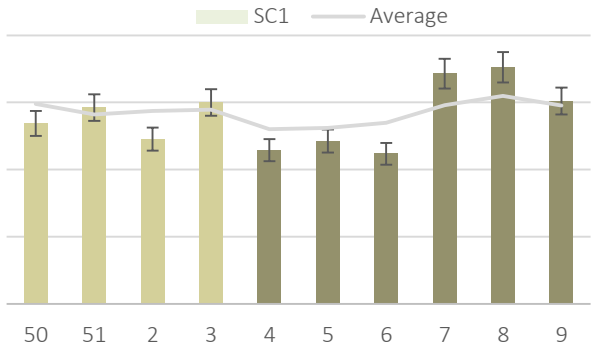


SC1	Week 50 – Week 3	*r* = .182	*p* = .016
	Week 50 – Week 4	*r* = .194	*p* = .006
	Week 50 – Week 5	*r* = .229	*p* = .000
	Week 50 – Week 9	*r* = .167	*p* = .000
	Week 51 – Week 3	*r* = .157	*p* = .093
	Week 51 – Week 4	*r* = .156	*p* = .095
	Week 51 – Week 5	*r* = .187	*p* = .011
	Week 51 – Week 9	*r* = .157	*p* = .007

Q6_R Perception & Group Functioning

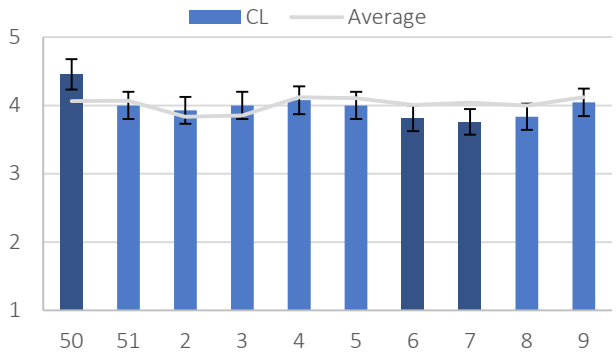


CL	Week 50 – Week 6	*r* = .211	*p* = .040
	Week 50 – Week 7	*r* = .223	*p* = .020
	Week 50 – Week 9	*r* = .226	*p* = .018



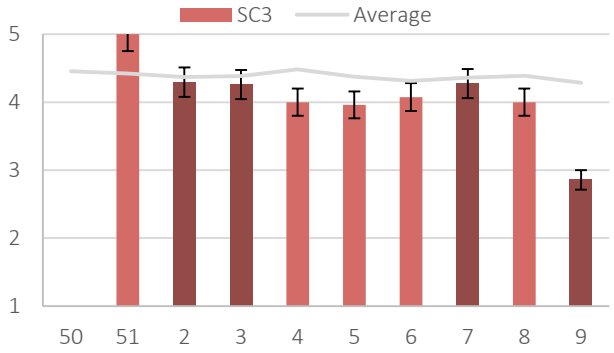
SC1	Week 4 – Week 7	*r* = .182	*p* = .016
	Week 4 – Week 8	*r* = .222	*p* = .001
	Week 4 – Week 9	*r* = .212	*p* = .001
	Week 5 – Week 7	*r* = .159	*p* = .080
	Week 5 – Week 8	*r* = .198	*p* = .004
	Week 5 – Week 9	*r* = .176	*p* = .024
	Week 6 – Week 8	*r* = .163	*p* = .060

Q7 Emotion & Task Performance

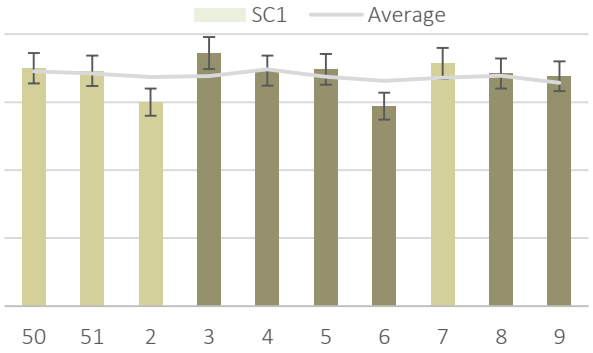


CL	Week 50 – Week 6	*r* = .201	*p* = .071
	Week 50 – Week 7	*r* = .212	*p* = .039

Q8 Synergy

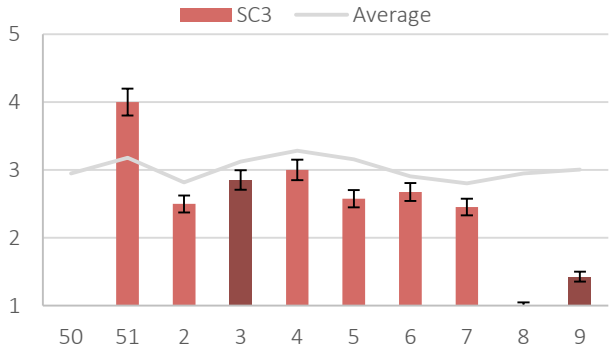


SC3	Week 2 – Week 9	*r* = .298	*p* = .068
	Week 3 – Week 9	*r* = .278	*p* = .021
	Week 7 – Week 9	*r* = .251	*p* = .008



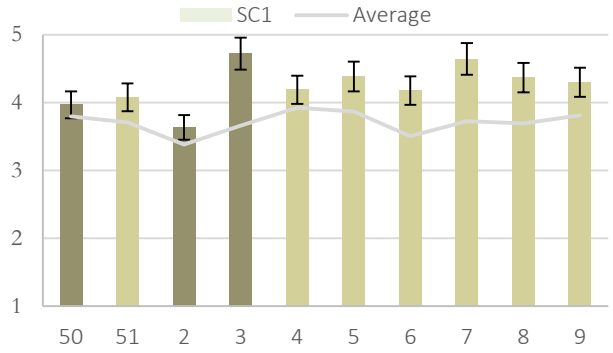
SC1	Week 3 – Week 6	*r* = .196	*p* = .005
	Week 4 – Week 6	*r* = .159	*p* = .082
	Week 5 – Week 6	*r* = .168	*p* = .043
	Week 6 – Week 7	*r* = .171	*p* = .035
	Week 6 – Week 9	*r* = .158	*p* = .085

Q10 Trust



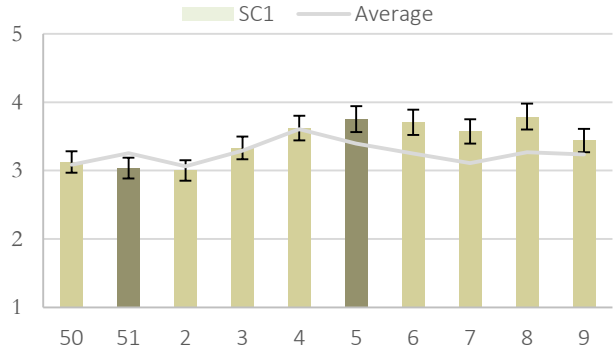
SC3	Week 3 – Week 9	*r* = .259	*p* = .049

Q11 Group Cohesion

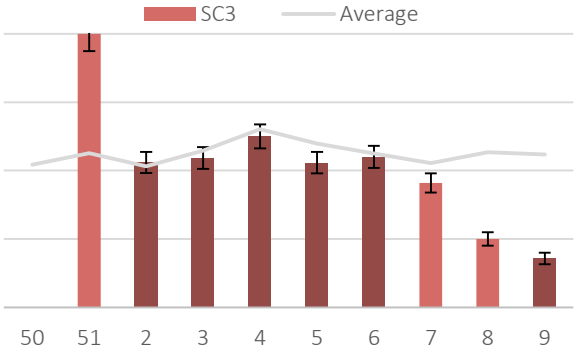


SC1	Week 50 – Week 3	*r* = .159	*p* = .082
	Week 2 – Week 3	*r* = .172	*p* = .032

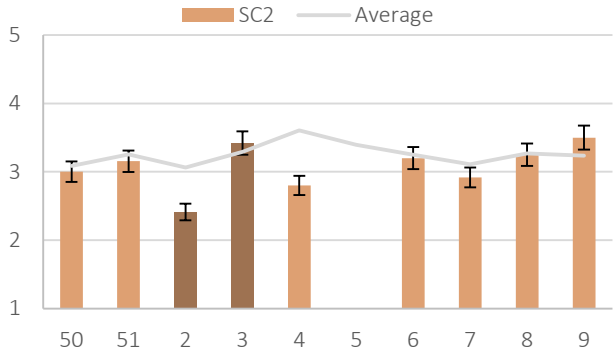
Q12 Perception



SC1	Week 51 – Week 5	*r* = .156	*p* = .095



SC3	Week 2 – Week 9	*r* = .260	*p* = .047
	Week 3 – Week 9	*r* = .279	*p* = .020
	Week 4 – Week 9	*r* = .280	*p* = .020
	Week 5 – Week 9	*r* = .264	*p* = .039
	Week 6 – Week 9	*r* = .282	*p* = .017



SC2	Week 2 – Week 3	*r* = .380	*p* = .002

Table 20 Significant Changes over Time per Company

Factor	Reflection on project					Collaborative attitude						
Questions	Q10	Q5	Q12	Q11	Q7	Q8	Q3	Q9	Q6_R	Q4	Q2_R	Q1
CL					X		X		X			X
MC										X		
SC1		X	X	X		X	X		X		X	
SC2		X	X								X	
SC3	X		X			X						X
SC4												

Table 20 helps interpreting the results. The interpretation of the results leads to the following findings:

CL. The client changed significantly concerning Q1 – Emotion, Q3 – Attitude & Group Functioning, Q6 – Perception & Group Functioning, and Q7 – Emotion & Task Performance. It is remarkable that the scores of the responses of week 50 – 2017 are higher than the averages and scores of the other weeks. The scores of both Emotion and Group Functioning are significantly decreasing over time. In week 50 – 2017 the last team building and alignment event was organized and the promotion of the dashboard started. This could clarify the differences in scores. Also, decreasing enthusiasm could be an explanation. In week 49 – 2017 and week 50 – 2017 multiple sub-interventions came into practice. Due to the newness of the Coalition, respondents could be more excited.

MC. The attitude of the managing contractor is relatively stable and only differs on Q4 – Motivation between week 50 – 2017 and week 8 – 2018. The employees are more motivated to work hard when this is rewarded in week 8 – 2018 than in week 50. Both the Contractor Reward System and the Crafts Recognition Program are initiated to increase motivation of employees to work harder. The Crafts Recognition Program is officially introduced through a presentation for all contractors and promotion posters in week 4. The program rewards employees of contractors if they showed collaborative behavior. However, employees of the client and the managing contractor are not eligible for this reward. This could have led to jealousy amongst managing contractor's employees. However, no significant differences are found in the client's responses.

SC1. 7 out of 12 questions changed significantly over time for SC1. No pattern in changes can be noticed. This may indicate that the respondent profile of SC1 is diverse. Looking at the raw data, the data has 'suspicious' entries. Some surveys have similar hand-writing on multiple surveys handed in at the same day for example. However, it is difficult to consistently filter out this data and therefore is not done.

SC2. SC2 changed its attitude significantly concerning Q2 – Stress, Q5 – Communication & Leadership, and Q12 – Perception. Their stress level decreased between week 2 – week 8 (r = 0.289). During the Christmas Holidays, the subcontractor continued their work. This could be an explanation of the high stress level, low score on communication and leadership, and negative stance. Also, the introduction of the Crafts Rewards Program could be a reason for more stress. Employees are assessed on their collaborative behavior.

SC3. Week 9 plays a pivotal role in the significant differences. SC3 shows a clear decrease in week 9 concerning Q1 – Emotion, Q8 – Synergy, Q10 – Trust, and Q12 – Perception. During the other weeks, the behavior is relatively stable. The steep decrease might indicate that this is an incident. In week 9, 4 of the 7 respondents filled in the open question from the survey concerning suggestions for improvement. Three of the suggestions refer to the poor communication in the project.

SC4. Most of SC4's responses were derived in week 51, 4, and 10. The responses did not differ significantly. So, no changes in responses are measured. SC 4 has a an Italian background and differs with the other companies with an American and Dutch culture concerning uncertainty avoidance (Hofstede, Hofstede, & Minkov, 2010). Uncertainty avoidance states to which extent the members of the culture are threatened by ambiguous and unknown situations. The Italian culture scores high on the uncertainty avoidance which means they are intolerant to unconventional behavior and ideas. This might explain why SC 4 did not change their attitude despite the initiated interventions.

7.4 Gallup Survey

In addition to the organizational behavior survey, Gallup's taskforce satisfaction surveys are conducted amongst employees of the client and managing contractor. The survey consists of 12 Gallup questions (GQ) which can be found in Appendix B. In total seven surveys are conducted of which the last two are relevant: October 2017 and January 2018. The coalition was officially introduced in in November 2017. Using the two surveys, a comparison in responses can be made. However, the number of respondents of the Gallup survey in January 2018 (117) is considerably lower than the organizational behavior survey (1595). The sensitivity of the Gallup survey is higher than the sensitivity of the organizational behavior survey. Furthermore, no significant differences can be found in the data with a 95% confidence interval. So, the meaning of the results must be carefully considered.

Table 21 Gallup's 12 Differences between October 2017 and January 2018

		October 2017	January 2018	Change
	Number of Respondents	127	117	-8.5%
GQ1	Task	4.21	4.21	0.0%
GQ2	Tools	3.97	4.07	2.5%
GQ3	Opportunity to do best	3.75	4.14	10.4%
GQ4	Recognition	3.28	3.24	-1.2%
GQ5	Care	3.94	4.02	2.0%
GQ6	Development	3.39	3.48	2.7%
GQ7	Opinion Matters	3.72	3.82	2.7%
GQ8	Mission/Purpose	4.02	4.16	3.5%
GQ9	Quality Commitment	3.84	4.05	5.5%
GQ10	Friend	3.86	4.07	5.4%
GQ11	Progress	3.32	3.64	9.6%
GQ12	Learning and Growth	4.13	4.14	0.2%

7.4.1 Gallup Survey Results

Table 21 shows the averages and percentage changes between October 2017 and January 2018. Gallup's survey differs from the Organizational Behavior Survey but there are commonalities. The findings of the Gallup can support and give a direction for the conclusions regarding client and managing contractor drawn from the organizational behavior survey.

The results of the Gallup survey indicate that the satisfaction amongst employees of the client and the managing contractor increased. This might be caused by the introduction of the coalition. Since the introduction of the coalition, a large increase in GQ3 – Opportunity to do best (+10.4%), is observed. Possibly, it became easier to do what people do best due to the organization of the team building and alignment events, extra coordination meetings, and integrated site walks. These events and meetings gave coalition members the opportunity to increase communication and collaboration. It led to reduced interfaces between actors. Furthermore, the events and meetings gave coalition members the opportunity to improve

relations with other coalition members. This is supported by the finding that Q10 – Friend (+5.4%) increased too. This Gallup aspect reflects on the relation with other employees.

The responses concerning GQ11 – Progress (+9.6%) increased too since the start of the coalition. The new construction manager, who has experience in changing behavior to increase progress, might be more involved with the employees of the client and managing contractor. As the amount of coordination meetings increased, the presence of the construction manager increased too. Coalition members are increasingly able to collaborate with the construction manager. Also, this could explain the increase in GQ9 – Quality Commitment (+5.5%). Employees are more committed to deliver quality work due to more coordination and collaboration.

The results concerning questions GQ8 – Mission/Purpose (+3.5%), GQ7 – Opinion matters (+2.7%), GQ6 – Development (+2.7%), GQ2 – Tools (+2.0%), and GQ5 – Cares (+0.2%), GQ1 – Task (0%), and GQ4 – Recognition (-1.2%) show little differences between October 2017 and January 2018. These percentages are so little that it is unreliable to conclude that there are differences. So, this means that either not enough data was retrieved to conduct an appropriate analysis or the distributions are similar.

7.4.2 Gallup Survey and Organizational Behavior Survey

Some of the questioned aspects of the Gallup and organizational behavior survey can be related to each other. Seen from an organizational behavior perspective, GQ3 – Opportunity to do best and GQ9 – Quality Commitment relate to the aspect Task Performance (Q7 of Figure 12). The Gallup aspects assess the performance of the respondent and of other employees. Since the introduction of the coalition this has increased. The respondent is able to perform his/her job better. Other employees are, according to the respondents, more committed to perform and deliver qualitative work. However, the increases in Gallup results are in contrast with the results of organizational behavior surveys. These analyses show a clear significant decrease in Group Functioning and Task Performance of the client. The managing contractor did not change significantly. The results of the Gallup and trend analyses suggest that the coalition itself improves Task Performance and Group Functioning for the client and managing contractor. However, since the coalition is in place the Task Performance and Group Function decreased for the client. Possibly, the clients' enthusiasm decreased after the coalition introduction and this is reflected in the results of the trend analyses.

GQ8 – Mission/Purpose, GQ7 – Opinion matters, and GQ5 – Care can be related to the organizational aspect of Group Cohesion (Q11 of Figure 12). Feeling part of one project team can be characterized by a shared mission, possibilities to discuss your opinion, and care for employees. Looking at the trend analyses, Group Cohesion also did not change for the client and managing contractor. This suggests that the introduction of the coalition, its sub interventions, and working within the coalition do not impact Group Cohesion for the client and the managing contractor.

GQ5 – Care and GQ1 – Task relate to the organizational behavior aspects Communication & Leadership (Q5 of Figure 12). The role of the supervisor and leader is reflected in the Gallup questions. In both the Gallup analysis and the trend analyses no (significant) change is measured. This suggests that the introduction of the coalition, its sub interventions and working within the coalition do not impact the Communication & Leadership for the client and managing contractor.

GQ4 – Recognition relates to the organizational behavior aspect Task Performance (Q7 of Figure 12). The Gallup question assesses the recognition for the respondent for doing good work. In the organizational behavior survey the respondent assessed himself/herself concerning performance. The client's Task Performance decreased significantly over time as can be seen in the trend analyses. This suggests that the

introduction of the coalition itself did not impact the Task Performance for the client and the managing contractor. Working within the coalition did decrease the Task Performance.

Q2 – Tools and Q12 – Learning and Growth are unrelated to questioned organizational behavior aspects. These questions do not help interpreting the trend analyses and due to the minor differences over time, little can be said about the effect of the coalition. Also, it is too premature to state that Q2 – Tools and Q12 – Learning and Growth do not have an effect.

7.5 Conclusions

The survey responses of coalition members are the data which is used to analyze the effect. The project actors are analyzed collectively and are categorized by company and experience. The effect of the coalition is approached by analyzing how companies differ in attitude from each other and how experience impacts the survey scores. The attitudes are measured whilst the coalition was in place.

Sub-question 3: What is the effect of a coalition on actors?

Project Organization

As explained in Chapter 5, the intervention changed the contractual and organizational structure. The intervention brought the client, managing contractor, and subcontractor together to increase and streamline collaboration. The relations between the actors became closer. The results indicate that working together reduces the differences in attitude between actors. This is explained by the findings that the differences in attitude between the client and the managing contractor are minimal. These actors collaborated since the beginning of the project. The subcontractors showed significant differences in attitude compared to the client and managing contractor. They only participated in the project since the construction phase. These findings indicate that involving actors earlier in the project life cycle could help aligning attitudes.

There are significant differences in multiple organizational behavioral aspects between the coalition members. On the one hand, actors strongly differ in attitude towards communication & leadership, group cohesion, perception, emotion, and trust. The largest differences are found in the attitude towards communication & leadership and group cohesion. This is supported by the finding that the majority of suggestions of improvement concern communication (177/597), coordination (87/597), and collaboration (74/597). These results suggest that large differences in attitude between coalition members are undesirable because these aspects need improvement. Moreover, these findings state that those aspects are affected by the company of the coalition members. On the other hand, coalition members hardly differ in attitude concerning stress, motivation, perception & group functioning, and changing way of working. This indicates that these behavioral aspects are not affected by the company of the actor. This means that these aspects are generic for all employees working at the project.

There are significant differences between companies. On the one hand, companies strongly differ in attitude towards communication & leadership, group cohesion, perception, emotion, and trust. Moreover, the majority of suggestions for improvement concern communication, coordination, and collaboration. These findings suggest that large differences in attitude between companies are undesirable because these aspects need improvement. On the other hand, companies hardly differ in attitude concerning stress, motivation, perception & group functioning, and changing the way of working. This indicates that these behavioral aspects are not affected by a specific company.

Focusing on all coalition members, three trends were observed during the coalition.

1. In general, the coalition members reflected more positive on the project since the coalition was formed. The aspects communication and leadership showed the steepest positive increase. Possibly, the coalition foresees in the large need for improved communication and leadership. The increase might be caused by the strengthened relation between the coalition members and the team building and alignment events, extra coordination meetings, integrated site walks, and promotion. In addition, coalition members were more satisfied about their task performance. Also, they felt more part of one team and became in general more positive about the project.
2. During the coalition, the coalition members showed less trust in completing the project in time and enjoyed working together with other companies less. Moreover, the enjoyment of doing the job decreased over time. The newness of the intervention could have played a role in the decrease. The managing contractor needed to sell their idea and tried to actively involve and motivate other coalition members to enter the coalition. People reacted positively but the excitement decreased over time. In addition, the network structure could have led to the negative trend. Now, coalition members are directly confronted with all problems and challenges discussed in meetings and events. The transparent environment might lead to the confronting and unsatisfying truth.
3. No significant differences were measured in synergy, attitude towards changing way of working, stress, external motivation, and seeing others as competitors during the coalition. The reward systems for the coalition companies and the coalition construction craft might not have had an effect on people's motivation.

Coalition Members

Focusing on the actors individually, the survey results show significant differences in attitudes over time for almost all coalition members. The attitude of the client, the managing contractor, SC1, SC2, and SC3 changed their attitude. The attitude of SC4 did not change significantly. The responses to all organizational aspects changed significantly except for the attitude towards changing the way of working. So, either these changes are not measured or SC4 and the attitude towards changing the way of working are not affected by the coalition formation. Possibly, the attitude towards changing the way of working is parts someone's personality, which does not change easily. However, this research shows that on average, people agree to change their way of working (3.95/5.00 on a 5-point Likert-scale).

The client changed its attitude concerning Emotion, Attitude towards collaborating with others, Group Functioning, Perception, and Task Performance. The client's employees enjoyed their work less and were less satisfied about their performance. In addition, the attitude and perception towards collaboration with other companies changed negatively. However, the Gallup survey showed that satisfaction increased since the introduction of the coalition. This indicates that the coalition in general increases satisfaction. However, the satisfaction and collaborative attitude decreases working within the coalition. Team Building and Alignment Events, Extra Coordination Meetings, and Integrated Site Walks might negatively affect the client's attitude. The network structure shortens the relationships between actors, and subsequently opportunities to communicate and collaborate increased. The client might have become increasingly aware of the difficulties and struggles of the project.

The employees of managing contractor only changed their motivation significantly during the coalition. It decreased since the introduction of the coalition. The Contractor Rewards System and the Crafts Recognition Program were initiated to improve motivation to work hard and reward collaborative attitudes. However, it is not applicable for the managing contractor. This might affect the attitude of the people as they could be jealous on the craft's personnel. The managing contractor seems to have a similar attitude working within the

coalition concerning the other aspects. This suggests that the coalition might not affect the employees. The Gallup survey shows an increase in satisfaction aspects. However, these could not be related to the contracting manager's attitudinal changes because there is no change is measured.

The Dutch subcontractors changed their attitudes towards multiple organizational behavior aspects significantly. One Dutch subcontractor continued their work during the Christmas holidays. Their stress level increased significantly which could be attributed to the need to continue work. Also, one of the subcontractors seems to be positively affected by increased meeting moments and alignments because their attitude towards communication and leadership significantly become more positive.

The Italian subcontractor did not significantly change its attitude. The Italian culture might be the reason for the absence of significant differences. The culture scores high on uncertainty avoidance compared to the Dutch culture (Table 5). Uncertainty avoidance represents to which extent the members of the culture are threatened by ambiguous and unknown situations. They maintained their attitude and are not willing to change. This is supported by the finding that the subcontractor scored the lowest average concerning the willingness to change their way of working.

Experience

There are significant differences between employees with different experience. On average experienced employees are more motivated by rewards than employees with little experience (r = 0.272). Also, unexperienced employees feel less part of a project team but see others less as competitors than experienced employees. Moreover, unexperienced employees are less positive about the project and find the communication and leadership poorer. So, experience possibly affects the perception and attitude towards communication and leadership.

Sub-question 4: What are drivers of actors to change their behavior?

The coalition and the sub-interventions give input to change the behavior of the coalition members (Figure 14). The Organizational Behavior Survey measures the attitude towards multiple process and outcome aspect relevant for individuals and groups. The attitudes towards multiple aspects changed significantly during the coalition. From a managing contractor perspective, it useful to understand: why people changed their attitude and what caused these changes in attitude.

In this research, the coalition and multiple sub-interventions are associated with the changing processes and outcomes. Multiple drivers of people can be associated with the changing attitude of people:

- **Governance structure.** The governance structure is affiliated with increased collaboration. Theoretically, the relationships between the coalition members are intensified. Especially, the relation between the client and subcontractors and between subcontractors strengthened. The governance structure is associated with the alignment of attitudes. The attitudes of the client and managing contractor differ hardly. They collaborated since the start of the project. Both actors were involved in the engineering, procurement, and construction phase. Other subcontractors entered the project later and show significant differences in attitudes. In general, the group cohesion and the perception on group functioning increased. Both aspects are affiliated with collaboration.
- **Contractual structure.** The new contractual structure can defined as relational contracting. However, the formal contract did not change as part of the coalition intervention. An incentive is added to the contract and the subcontractors are reimbursed for extra expenses. The extra financial incentive (the contractor reward system) and is associated with the increase in attitude towards group

cohesion and the perception on group functioning. However, no significant changes were observed in motivation of the subcontractors due to the crafts recognition program (applicable for subcontractors only). The managing contractor showed even a decrease in motivation. Possibly, employees of the managing contractor were jealous on the financial reward of subcontractors. This is supported by the finding that 6 suggestions of improvement of the managing contractor concern the absence of rewards.

- **Culture.** There is an association between the culture of actors and their attitudes. The attitudes of the client and managing contractor differ hardly. Both companies have an American and Dutch background. The attitudes of the client and managing contractor differ significantly with the Italian subcontractor. The Italian culture scores high on uncertainty avoidance whereas the American and Dutch culture scores low. This might explain why the Italian subcontractor did not change significantly its attitude over time and why they scored high on average concerning project reflection.
- **Communication and Leadership**. Amongst coalition members, communication was the most suggested improvement to make the project a success (177 of 597 suggestions). 87 out of 597 suggestions to improve concerned the leadership of the project. During the coalition, a positive trend concerning communication and leadership was measured. Possibly, the new organizational network structure stimulated communication between coalition members. Moreover, this structure stimulated transparent communication. Some subcontractors showed positive significant increases in their attitude towards communication and leadership whereas the client showed a decrease in joy and satisfaction. Team building and alignment events, extra coordination meetings, and integrated site walks might negatively affect the client's attitude because they might have been faced with the real challenges and problems due to the transparent communication.

8 CONCLUSIONS

The objective of this research was to understand organizational behavior and the effect of a coalition during the construction phase of a large construction project. The main research question is:

> **Research question**: What is the effect of a coalition during the construction phase?

In this chapter, a final answer is given to the research question. By answering the four sub-questions the main conclusion can be drawn. At last, the contributions of this research to science are discussed.

> **Sub-question 1:** What is the difference in contractual structure before and after the coalition formation?

A coalition is a temporary alliance of distinct parties for joint action. The coalition consists of the client, managing contractor, and critical subcontractors. The objective of the coalition is to increase collaboration to accelerate the construction process. Eventually, this may lead to improved long term relationship between the actors.

The coalition caused a difference in the contractual structure. An incentive to share gains is introduced as part of the coalition on top of the formal contract between the client, managing contractor, and subcontractors. The formal contract, already in place before the coalition formation, is a reimbursable contract between client and the managing contractor and lump-sum and unit/rate contracts between the subcontractors and the managing contractors. However, as part of the coalition formation a financial incentive was added to the contracts. The client, managing contractor, and critical subcontractors are jointly responsible to deliver the project at a certain end date. If this date is met, a financial reward will be distributed. The subcontractors are de-risked for extra expenses due to the coalition formation.

The new incentive and gain sharing can be defined as a shift towards relational contracting. The coalition intervention consists of the five relational contracting core aspects: commitment, trust, cooperation and communication, common goals and communication, and win-win philosophy. In addition, the intervention incorporates continuous improvement, facilitated workshops, real gain-share / pain-share, and a joint declaration statement.

As part of the coalition, the organizational structure changed from a hierarchical structure towards a network structure. Meetings and events are organized to bring the client, managing contractor, and the subcontractors together. This led to an environment where all actors were able to communicate directly with each other instead through the managing contractor. This intensified the relations between the client and subcontractors and between the subcontractors. So, the organizational change offers opportunities to increase collaboration amongst the involved actors.

> **Sub-question 2:** How can organizational behavior be measured?

Organizational behavior is an umbrella term for a range of aspect which influences people working within an organization. Individual, group, and organizational aspects affect the behavior of people. In this research, the Organizational Behavior Survey is developed to measure the attitude of people working on the project towards aspects of organizational behavior. Underlying this survey is the belief that behavior is not random. Gaining insight in the attitude of people concerning certain aspects of organizational behavior can help project managers understand behavior of people.

The Organizational Behavior Survey is developed to anonymously measure the attitudes of people towards individual and group behavioral aspects on a weekly basis. The model combines relevant scientific theory concerning changing behavior in the construction industry. The survey questions fourteen behavioral aspects which are relevant during the implementation of the coalition. The survey questions are based on scientific literature and are reviewed by experts to maximize content validity.

The statistical model made from the data of 1622 respondents has a good reliability (Cronbach's $\alpha = 0.748$) and measures three underlying constructs: reflection on project (Cronbach's $\alpha = 0.794$), collaborative attitude (Cronbach's $\alpha = 0.627$), and miscellaneous (Cronbach's $\alpha = 0.337$). The latter construct hardly measures an underlying construct and therefor these items need to be interpreted separately.

The weekly survey can be used as part of a dashboard. In addition to the cost-, quality-, and time-control, managers are able to track the attitude towards selected organizational behavior aspects of its employees. This information gives new input for the decision-making process of a manager. For the first time, a manager can see what the effect is of his/her interventions and ideas on the attitude of the workforce. This is beneficial because of two reasons. First, the manager can gain insight in if the attitudes are actually changing due to the intervention. Second, if the same survey is used for similar interventions at other projects, the effects of the interventions can be compared. Ideally, the manager gathers extensive information about the effects of multiple interventions assessed at multiple projects, that a toolbox with tested interventions can be created. If the manager measures certain undesired attitudes of people in the organization, a suitable intervention can be chosen from the toolbox to overcome the problems.

Sub-question 3: What is the effect of the coalition on actors?

The responses of the Organizational Behavior Survey and the Gallup survey of the coalition members are used to analyze the effect of the coalition intervention. The project actors are analyzed collectively and are categorized by company and experience. The differences between members, trend analyses of the attitudes of members, and experience of members are analyzed to answer sub-question 3.

The intervention changed the contractual and organizational structure. The coalition gave members the opportunity to increase communication and collaboration. The relationships between the client, managing contractor, and subcontractor became closer. The results indicate that working together reduces the differences in attitude between actors. The differences between the client and the managing contractor are minimal. Whereas, subcontractors showed significant differences in attitude compared to the client and managing contractor.

There are significant differences in attitudes towards organizational behavior aspects between coalition members. On the one hand, companies strongly differ in attitude towards communication & leadership, group cohesion, perception, emotion, and trust. Moreover, the majority of suggestions for improvement concern communication, coordination, and collaboration. These findings suggest that large differences in attitude between companies are undesirable because these aspects need improvement. On the other hand, companies hardly differ in attitude concerning stress, motivation, perception & group functioning, and changing the way of working. This indicates that these behavioral aspects are not affected by the employee's company and are generic for all employees working at the project.

Focusing on all coalition members, the coalition intervention is associated with three trends:

1. The coalition members reflected more positive on the project during coalition. The attitude towards communication and leadership became more positive. Coalition members were more satisfied about

their task performance. Also, they felt more part of one team and became in general more positive about the project.

2. The coalition members showed less trust in completing the project in time and enjoyed working together with other companies less. Moreover, the enjoyment of doing the job decreased over time. These decreases could be explained by decreasing excitement amongst coalition members and the new collaboration environment to a confronting and unsatisfying truth.
3. No significant differences were measured in synergy, attitude towards changing way of working, stress, external motivation, and seeing others as competitors during the coalition. The reward systems for the coalition companies and the coalition construction craft might not have had an effect on people's motivation.

Focusing on the coalition members individually, the survey results show significant differences in attitudes over time for the client, managing contractor, and three out of four subcontractors. Multiple changes of attitudes are affiliated with the coalition intervention. The responses to all organizational aspects changed significantly except for the attitude towards changing the way of working. This result suggests that the stance towards changing the way of working is not affected by the coalition.

During the coalition, the client showed a decrease in enjoyment at work, satisfaction about their performance, and a more negative attitude and perception towards collaboration with other companies. However, satisfaction increased since the introduction of the coalition. This indicates that the coalition in general increases satisfaction. However, the extra events and meetings might have negatively affected the client's attitude because the client possibly became aware of the difficulties and struggles on site. Also, decreasing excitement could be a reason for the negative trends.

The employees of managing contractor showed a significant decrease in motivation during the coalition. The introduced reward systems are not applicable for the managing contractor. This might have affected the attitude of the people as they could be jealous on the craft's personnel. The managing contractor seems to have a similar attitude working within the coalition concerning the other aspects. This suggests that the coalition might not affect the employees of the managing contractor.

The Dutch subcontractors changed their attitudes towards multiple organizational behavior aspects significantly. One Dutch subcontractor continued their work during the Christmas holidays. Their stress level increased significantly which could be attributed to the need to continue work. Also, one of the subcontractors seems to be positively affected by increased meeting moments and alignment events because their attitude towards communication and leadership significantly became more positive.

The Italian subcontractor did not significantly change its attitude. The Italian culture might be the reason for the absence of significant differences. The culture scores high on uncertainty avoidance compared to the Dutch culture. They maintained their attitude and were not willing to change. This is supported by the finding that the subcontractor scored the lowest average concerning the willingness to change their way of working.

There are significant differences between employees with different experience. On average experienced employees are more motivated by rewards than employees with little experience (r = 0.272). Also, unexperienced employees feel less part of a project team but see others less as competitors than experienced employees. Moreover, unexperienced employees are less positive about the project and find the communication and leadership poorer. So, experience possibly affects the perception and attitude towards communication and leadership.

Sub-question 4: What are drivers of actors to change their behavior?

Based on the survey responses analyzed in this research, the attitudes towards multiple organizational behavior aspects changed significantly during the coalition. Understanding why people change their attitude is valuable for project managers because this gives them opportunities to increase the adequacy of managerial interventions and adapt their own managerial practices in order to increase organizational effectiveness. Multiple drivers of people are associated with the changing attitude of people surveyed in this research:

- **Contractual structure.** The new contractual structure can defined as relational contracting. The extra financial incentive (the contractor reward system) is associated with the increase in attitude towards group cohesion and the perception on group functioning. However, no significant changes were observed in motivation of the subcontractors due to the crafts recognition program (applicable for subcontractors only). The managing contractor showed even a decrease in motivation.
- **Governance structure.** The governance structure is associated with the alignment of attitudes and increased collaboration. In addition, the meetings and events increased communication and collaboration.
- **Culture.** There is an association between the culture of actors and their attitudes. The attitudes of the client and managing contractor differ hardly as they have a similar culture. The attitudes of the client and managing contractor differ significantly with an Italian subcontractor. The Italian culture scores high on uncertainty avoidance whereas the American and Dutch culture scores low. This might explain why the Italian subcontractor did not change significantly its attitude over time and why they scored high on average concerning project reflection.
- **Communication and Leadership**. Amongst coalition members, communication and leadership were the most suggested improvements to make the project a success (264 of 597 suggestions). During the coalition, a positive trend concerning communication and leadership was measured. Some subcontractors showed positive significant increases in their attitude towards communication and leadership whereas the client showed a decrease in joy and satisfaction. Team building and alignment events, extra coordination meetings, and integrated site walks might negatively affect the client's attitude because they might have been faced with the real challenges and problems due to the transparent communication.

Research question: What is the effect of a coalition on organizational behavior?

This research studies the effect of a coalition to increase collaboration to improve organizational effectiveness. The project management team introduced the coalition with the goal to change people's behavior towards more collaborative attitudes. More collaboration should lead to increased organizational effectiveness and form a basis for long-term relationships.

In this research, the Organizational Behavior Survey is developed to weekly measure the attitude of people working on the project. This survey can be used as part of a dashboard. In addition to the cost-, quality-, and time-control, managers are able to track the attitude towards selected organizational behavior aspects of project employees. This information gives new input for the decision-making process of a manager. For the first time, a manager can see what the effect is of his/her interventions and ideas on the attitude of the workforce. This is beneficial because of two reasons. First, the manager can gain insight in if the attitudes are actually changing due to the intervention. Second, if the same survey is used at other projects, a database can

be created. At some time point, the manager collected so much data of the interventions that a toolbox with suitable interventions is her/his disposal.

This research showed that project managers have more opportunities to govern their project than just focusing on the iron triangle. Measuring the workforce's attitude changes traditional project management and the way project objectives can be set. Nowadays, managers set up goals based on time and costs: *deliver the project 20% faster and 20% cheaper*. But, tracking the attitude of the project members offers opportunities to set additional objectives like: *half-way the project the majority project members need to score at least 4 out of 5 concerning motivation*. Motivated people deliver better results. It is important to take possible resistance effects of the new governance form on the people in the organization into account.

On organizational level, the coalition changed the contractual structure of the project. Coalition members became jointly responsible for delivering the project in time. They are jointly rewarded if the project is delivered at the agreed date. However, there is no indication that rewards motivate coalition members. Also, the organizational structure of the project changed. The traditional hierarchical structure of client, managing contractor, and sub-contractors changed towards a network structure. This is associated with changing attitudes of coalition members. This process followed the five stage group development process. New and shorter ties between the coalition members are created which can stimulate communication between them. The coalition introduces a structure where actors dynamically can collaborate.

Focusing on all project members collectively, the coalition intervention is associated with a more positive reflection of the project during the coalition. The attitude towards communication and leadership, task performance, group cohesion, and perception became more positive. However, the coalition members showed a decrease in attitude towards trust, emotion, and working with others. No effect was measured concerning synergy, attitude towards changing way of working, motivation, and group functioning.

On group level, changes during the coalition in attitude of coalition members are associated with four drivers:

- **Contractual Structure.** The mutual incentive which is added on the existing contracts stimulates actors to join the coalition. The incentive is affiliated with a more positive attitude group cohesion and the perception on group functioning. However, the new contractual structure is not associated with changed attitude towards motivation. Also, financial rewards are not affiliated with increase in motivation.
- **Governance Structure.** A network structure brings project actors together to increase and streamline the collaboration. This is supported by the findings that the differences in attitude between the client and the managing contractor are minimal. These actors collaborated since the beginning of the project. The subcontractors showed significant differences in attitude compared to the client and managing contractor. They only participated in the project since the construction phase. These findings indicate that involving actors earlier in the project life cycle could help aligning attitudes.
- **Culture.** The findings of this research indicate that (company) culture influences the attitude of the employees. The client and the managing contractor have similar cultural backgrounds and they show minimal differences in attitude. This indicates that similar cultures help aligning attitudes. This offers opportunities when configuring a project team. Hofstede's cultural dimensions could help interpreting the expected attitude of companies during the project team set-up. A project manager can make use of this information to configure a project team which, theoretically, will perform optimally.

- **Communication and Leadership.** An important aspect of successful implementation is communication about the organizational changes by the initiators. On average, respondents had a neutral stance towards the '*changes in the way of working are communicated clearly*'. This is supported by the finding in this research that the majority of improvement suggestions concerned the need for better communication. All involved people in the organization need to be clearly informed about the new intervention. In this way, potential resistance can be overcome.

8.1 Contributions to the Research Gap

In Chapter 1 is stated that there is knowledge gap concerning 'soft' aspects of project management. More specifically, there is a knowledge gap regarding behavior in the construction industry. Organizational behavioral aspects are studied extensively using a coalition intervention initiated by a managing contractor to increase collaboration. The research contributes in the following ways:

- This research combines the domain of project management with psychology, sociology, and anthropology in the context of the construction industry. This combination is hardly researched in the construction industry and this research can be seen as an explorative study. The findings in this research give other researchers starting points for future research.
- The Organizational Behavior Survey, developed in this research, gives the opportunity to quantify the human aspect of the project management domain. The results presented in this research, gives other researchers starting points to construct hypotheses.
- This research contributes to the understanding of a coalition intervention and its effects, implemented during the construction phase. This research led to additional knowledge about coalition effects as project management intervention.

9 Discussion

The objective of this research was to understand the effect of a coalition during the construction phase. A theoretical framework based on scientific literature was developed to develop a measurement instrument. The attitude towards multiple organizational behavior aspects is measured through a weekly survey. After preliminary data analysis, the findings are analyzed regarding intercompany differences, experience differences, and changes in responses. In addition, a Gallup survey is conducted to help understand the findings. Multiple points of discussion concerning the methodology and findings are discussed in this chapter.

9.1 Research Methodology

9.1.1 Type of Research

During action research, theoretical studies, data gathering, analyzing, interpreting, and reporting are conducted at the same time. Action research is characterized by continuous iterations (Stringer, 2007). In this research, the iterations regarding the survey development are limited. Normally, a survey is tested with a small sample from the target group. These findings are used to improve the survey. In this research, it was not realistic to perform multiple iterations due to limited time. The organizational behavior survey developed during this research can be seen as the 'first' iteration. Future research can make use of the Organizational Behavior Survey and elaborate on the findings presented in this research.

9.1.2 Data Collection

The distribution and collection of an organizational survey is an extensive process. The surveys were distributed in person by the author. This caused three limitations. First, the respondents might be affected by the person who is distributing the cards. Second, due to the number of people working on different project sites, it was impossible to personally hand over the surveys to every employee. Therefore, the subcontractors handed out the surveys themselves. However, there was no control on this process and this might have affected the way people responded to the survey. Third, the data entry process was done by the author solely. Occasional errors can be expected because no one else supervised this process (Edwards & Thomas, 1993).

9.1.3 Respondents

All the project members of the RAHC project were targeted for the Organizational Behavior Survey. Staffing and de-staffing could have had an effect on the outcome of the organizational behavior and Gallup survey. Due to the anonymous surveys, the data could not be traced back to the respondents. Therefore, there must be assumed that the respondents differed each time the survey was conducted. Also, the job duration of the respondents could have influenced the outcome of the surveys. Some people have specialist jobs and are on site only for a short period of time and are not exposed to other companies for example. As found in this research, there are significant differences in responses between Short Service and Safety Mature employees.

Statistically, all measures are taken to exclude incorrect data. However in practice, the author had the suspicion that not all data entries were reliable. Some surveys filled in on the same day had the same handwriting. This indicates that one person filled in multiple surveys. However, it is very hard to distinct those communalities during data processing. So, no corrections were made for these possible irregularities.

9.2 Research Findings

9.2.1 Theoretical Model

The theoretical model presented in Figure 11 is based on scientific literature. There are numerous scholars who have knowledge about organizational behavior. In order to focus, the author chose to mainly rely on the knowledge of Robbins & Judge (2013). In addition, the book of Griffin & Moorhead (2014) is studied to gain a substantive understanding. The knowledge of Robbins & Judge (2013) and Griffin & Moorhead (2014) formed the basis of the survey. Other literature was not considered for the survey development because there was time pressure to start surveying as soon as possible. If the survey development took longer, the attitudes of the respondents, just after the coalition introduction, could not be measured.

As presented in Figure 9, organizational behavior consists of large variety of aspects and disciplines. Due to the amount of research conducted concerning behavioral aspects, the definitions of the behavioral aspects are not mutually exclusive. The definitions constructed by Robbins & Judge (2013) are leading in the interpretation in this research. So, if the author would have used other theories about organizational behavior of other scholars, this might have led to a different theoretical model.

9.2.2 Cultural Dimensions of Coalition Members

All coalition companies employ people from multiple countries and therefore employ people with a different cultural background. Nevertheless, in order to categorize the coalition members, the cultural background of the coalition members is determined based on the country from where the company originates and/or resides. This generalization affected the way the results are interpreted using the cultural dimensions of Hofstede et al. (2010). If the coalition companies were not categorized and the cultural background of the individual employees was considered separately, it would make interpretation too complex.

9.2.3 Suggestions for Improvement

The suggestions for improvement are analyzed to summarize the areas of improvement to support the findings of the quantitative study. The analysis is limited to three First Cycle iterations and conducted without the use of professional coding software. The suggestions are manually categorized and reviewed three times. This is a suitable method to summarize the retrieved data, but a more thorough analysis with professional coding software could have led to more reliable findings.

9.2.4 Causality

In the social domain, causes and effects are complex (Gelman, 2010). It is hardly possible to statistically proof causation. Perfect correlation is not found in this research. Amongst academics, there is no consensus how to best answer causal questions (Gelman, 2010). Kenny (1979) states that three conditions must hold for a researcher to claim that *X* causes *Y*: (1) time precedence, (2) relationship, and (3) nonspuriousness. A spurious relationship means that two variables are not causally related to each other because a confounding variable is present. The criteria of time precedence and relationship are met in this research but nonspuriousness should be considered carefully. In general, experimenting is seen as the best alternative to 'proof' causation. This was not performed during this action research. The most convincing studies meet the following four criteria (Gelman, 2010):

- A simple data processing structure where data can be controlled and see through
- There is no clear plausible source of major bias
- Serious efforts are made to detect plausible biases
- The researcher is insensitive to small and moderate biases

These criteria are taken into account as much as possible by the author. However, a certain amount of (undetectable) bias will remain in the data and within this research. Despite the inability to fully prove causation, associations can be determined. An association is the statistical relationship between two variables. It describes situations where phenomena do occur more often together than not.

9.2.5 Interpretation

Two difficulties arise during the interpretation of the results. On the one hand, as mentioned earlier in the discussion, the organizational behavior aspects are not mutually exclusive. For example, Emotion and Stress are related (Lok & Bishop, 1999). This makes it hard to interpret the causality. Does Emotion affect Stress or does Stress also affect Emotion? On the other hand, the definitions of the questioned Gallup's items can be related to the organizational behavior aspects in multiple ways. The relations between those two aspects are not mutually exclusive. The interpretation of the author strongly influences the drawn conclusions.

9.2.6 Data Potential

To analyze the obtained data, the software IBM SPSS Statistics 25 is used. The functions of this software program are far-reaching but also limited. SPSS cannot perform mixed effect modelling which allows testing for fixed effects and random effects. However, other software programs such as STATA: Data Analysis and Statistical Software could be used to perform these tests. It allows the user to program own analyses. Due to limited time the author decided not to use this program and conduct those analyses.

10 RECOMMENDATIONS

After this research, recommendations are given for further scientific research and for Fluor. The recommendations are based on the findings and conclusions of this research. Moreover, practical recommendations are included too.

10.1 Scientific Research

- This case study solely focusses on the RAHC project. Therefore it would be of great value to conduct a similar research at another construction project. A thorough analysis of the differences between the projects should be made. In combination with another organizational behavior research this could give more insight in the possible causes of the differences in behavior. The findings of this research can be used to construct null hypotheses.
- A model is developed in this research to measure organizational behavior. This measurement model and data can be used for the measurement model for Structural Equation Modeling (SEM). The current model measures three latent constructs of which two are reliable: reflection on project and collaborative attitude. However, this model misses a structural model which imputes the relationships between latent variables. More insight in the causation of the effects of can be found using SEM.
- This research focuses on multiple aspects of organizational behavior at the same time. As mentioned in the Discussion, the research covers disciplines of psychology, sociology, and anthropology. Instead of focusing on multiple aspects, it can be valuable to focus on one aspect only and conduct similar analyses. In this way, more in-depth knowledge about behavior can be obtained. With more knowledge, project management interventions can be more acuminate. Eventually, even a 'toolkit' with specific project management interventions for certain behavior can be developed.
- The Organizational Behavior Survey is reliable and valid but can be improved as is shown in section 6.4.2 and Appendix F. So, this survey can be used for future research to obtain more reliable and valid findings and draw more concise conclusions.

10.2 Fluor

- Fluor should start measuring organizational behavior in current and future projects. People are key throughout the complete project life-cycle. Understanding behavior of the project employees can help to manage projects. Project management interventions can be acuminated on certain behavior. For example, continuously tracking the stress levels of project members can help to implement safety measures earlier.
- Improve the practical implementation of the survey. The surveys should be conducted electronically (for example per e-mail or using measurement terminals) which saves time. Moreover, the analyses should be automated. In this way, organizational behavior can be monitored and project managers can respond adequately. To conduct more valuable analyses the data should be traceable but the privacy must be guaranteed at all times. The privacy debate is a trending topic and will stay relevant. This requires clear communication towards the employees.
- Fluor should make use of the full potential of the obtained data set. The data can be considered as big data and alternative analyses can be conducted. The author has three suggestions. First, the used software to conduct the analyses is IBM SPSS Statistics 25. STATA: Data Analysis and Statistical

Software should be used to perform more complex analyses such mixed effect analysis. Second, Fluor should interpret the values of the behavior aspects and set objectives based on these values. The values itself are not interpreted in this research. For example, Fluor scores beneath average regarding Group Cohesiveness. New objectives can be defined to improve the feeling of one project team. Third, the current data set can be linked to other data sets. For example, the data of this research can be combined with the data regarding safety incidents. The relations and possible associations between behavior and safety incidents can be researched.

- There are associations that the coalition positively influences employee satisfaction and behavior. Seen from an organizational behavior perspective, form the coalition again and keep employees satisfied after the coalition formation. In addition, start coalitions earlier in the project life cycle. Then, collaboration is increased earlier which is positively related to project performance. However, after the implementation of the coalition multiple scores dropped heavily. Possibly, the decreasing excitement for the new intervention caused this drop. This should be taken into account during future practices.

11 REFLECTION

Multiple insights are obtained during this research. As researcher, I was involved in all the hierarchical layers of the project. This led to the following insights on which can be reflected on:

11.1 Current Situation

Within the project, the importance of people was widely acknowledged. People are the one who design, procure, and construct the project. They are the 'engine' of the project. They are the one who are ensuring the organization becomes more effective. But the current management practices are often too focused on the iron triangle: time, quality, and costs. Time, quality, and costs are continuously tracked in the projects and form the basis for decisions of people in the organization. These domains dominated the reasoning of the decisive people in the organization. The managers introduced new interventions and innovations to increase the effectiveness of the organization. But how does this affect the people who need to change. Are they willing to change? Are they ready to change? It would be valuable for project managers to have a system to understand their 'engine'; the people.

The majority of the people working on site accepted the status quo of cost overruns and time delays. Project managers had the best intentions to improve organizational effectiveness. But this led to misalignment between the intentions of the managers and the people working in the field. The attitude of the managers and the workforce were different. This misalignment caused two problems. On the hand, the workforce felt unheard as they initiated improvements. If they addressed these problems to higher management, no action is taken. On the other hand, the ideas of managers to improve the way of working did not land in the organization. To ensure the ideas of managers are implemented, power and control is used. A hierarchical governance structure fitted this situation perfectly.

Two characteristics of the construction industry stimulate the conservation of the hierarchical governance structure. First, the project life cycles are separated. The engineering, procurement, and construction phase are often separated phases and involve different actors. The client and managing contractor collaborated intensively during the complete project lifecycle. However, the subcontractors only come into play during the construction phase when the design of the project is largely finished. This is a missed opportunity because the subcontractors have practical know-how and a lot of experience. Second, the current contractual practices stimulate unilateral relationships. The contract specifies the obligations and liabilities towards each other and allocates risks. In the process engineering industry it is usual that a client hires a managing contractor who on their behalf contracts multiple subcontractors. This contractual structure stimulates the hierarchical governance structure.

11.2 Reflection on this Research

At some moments, I experienced resistance amongst multiple respondents. It is important to take these thresholds into account while implementing interventions. They were not willing to participate in this research for generally three reasons:

1. People felt threatened by the idea that their attitude or behavior will be measured. Their privacy would be compromised. Especially in the current societal debate, this is an important remark to take into account.
2. People did not understand the potential value of the research because no results could be presented so far. Again, this proves the need for communication.

3. People were not open to change their current way of working. They argued that they were doing their job already for years and there is no need to change or based on earlier experience new interventions do not work.

The Organizational Behavior Survey is an instrument to start understanding the attitude of project members. After the research, I realized that the survey gives new input for decision-making. This radically changes the current management practices. Decisions can be made, reasoned from a human aspect: This has three implications:

1. The manager can actually measure if the implemented interventions affect attitudes of the workforce.
2. Measuring the attitude of the workforce changes the way project objectives can be set. Tracking the attitude of the project members offers opportunities to set additional objectives like: *half-way the project the majority project members need to score at least 4 out of 5 concerning motivation.*
3. At some point in time, a manager can chose from interventions which have proved to change attitudes. A database can be created if the same survey is used at other projects. With data about the effects of similar interventions from multiple projects, comparisons between the interventions can be made.

The trend of digitization offers great opportunities for measuring attitudes within the project organization. It can catalyze the introduction of the new measurement process. Ideally, the respondent data is gathered and analyzed automatically because it should be accessible and be up-to-date for the project management team. The retrieved data can be linked to other data sets such as the progress, costs, and safety record. Researching these relationships can help managers take decisions.

At last, the attitude of the project management team and the effort to let the coalition succeed impressed me. They were very motivated to challenge the everlasting status quo of cost overruns, time delays, and dissatisfied in construction projects. They dared to develop new initiatives and to refute the status quo. I think this competence of seeking opportunities to improve organizational effectiveness should be one of the core competences of a manager. Understanding people's behavior and their drivers offers a unique opportunity for project managers to improve organizational effectiveness.

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APPENDIX A

Constructing a Survey

According to Edwards and Thomas (1993), setting up a survey consists of five general steps:

1. The objective of the survey is determined. The most effective method to obtain this objective is chosen. If surveying is the right method, a design plan for conducting the survey is set up.
2. The survey is constructed. Content about the subject needs be gathered and understood. Subsequently, the survey itself needs to be written. Multiple challenges arise constructing the survey. The researcher needs to take into consideration: grammatical issues, readability, rating scales, positively and negatively worded items, and survey length. All these aspects can influence the outcome of the survey. Moreover, the survey is pretested to increase the reliability of the results.
3. The way of processing and administrating the survey is chosen. The respondents and sampling method are selected. Then, the survey is distributed and collected.
4. The data is processed and the way to verify is chosen. A plan is made to deal with missing data. Subsequently, the data is analyzed using reliable analysis methods. The analyses are run and the results are interpreted.
5. The results are reported and presented.

APPENDIX B

Gallup's Q12 Survey Questions

Table 22 Gallup's Q12 Survey Questions

GQ	Aspects	Questions
1	Task	I know what is expected of me at work
2	Tools	I have the materials and equipment which I need to do my job right
3	Opportunity to do best	I have the opportunity to do what I do best every day
4	Recognition	In the last seven days, I have received recognition or praise for doing good work
5	Cares	My supervisor or someone at work seems to care about me as a person
6	Development	There is someone at work who encourages my development
7	Opinions matters	At work, my opinions seem to count
8	Mission/Purpose	The mission or purpose of my company makes me feel my job is important
9	Quality Commitment	My associated or fellow employees are committed to doing quality work
10	Friend	I have a best friend at work
11	Progress	In the last six months, someone at work has talked to me about my progress
12	Learning and Growth	This last year, I have had opportunities at work to learn and grow

APPENDIX C

Benefits, Difficulties, and Critical Success Factors of Relational Contracting

Benefits of Relational Contracting – derived from (Chan et al., 2010)

Table 4.1 Summary of research investigating the major benefits of adopting different forms of RC

Benefits of adopting different forms of RC	*RC (Rowlinson and Cheung, 2004)*	*Partnering (Chan et al., 2003a)*	*Alliancing (Ross, 2001)*	*PPP (Asian Development Bank, 2007)*	*JV (Carillo, 1996)*	*Total*
1. Better cost control	√	√	√	√	√	5
2. Better working relationship	√	√	√	√		4
3. Sharing of risk			√	√	√	3
4. Better time control		√	√	√		3
5. Efficient problem solving	√	√	√			3
6. Potential for innovation			√	√	√	3
7. Better quality product		√		√		2
8. Enhanced communication		√	√			2
9. Increased satisfaction	√		√			2
10. Drivers for the economy				√	√	2
11. Continuous improvement	√					1
12. Reduced litigation/dispute		√				1
13. Better productivity		√				1
14. Win-win attitude among the project participants		√				1
15. Improved culture					√	1
16. Lower administrative cost	√					1
17. Enhancement of reputation			√			1
18. Reduction of public financing				√		1
Total	6	9	9	8	5	

Difficulties of Relational Contracting – derived from (Chan et al., 2010)

Table 5.1 Summary of research investigating the major difficulties/potential obstacles in implementing different forms of RC

Major difficulties/potential obstacles in implementing different forms of RC	*Partnering (Chan et al., 2003b)*	*Alliancing (Ross, 2001)*	*PPP (Asian Development Bank, 2007)*	*JV (Carillo, 1996)*	*Total*
1. Risk sharing failure	√	√	√	√	4
2. Conflicts arising from misalignment of personal goals with the project goals	√		√	√	3
3. Inadequate experience with the RC approach	√		√		2
4. Relationship/communication problems	√	√			2
5. Substantial costs to establish alliance		√	√		2
6. Commercial pressure to compromise RC attitude	√				1
7. Uneven levels of commitment among project participants	√				1
8. Misunderstanding of RC concept	√				1
9. Dealing with large bureaucratic organizations impeding the RC effectiveness	√				1
10. Win-lose environment among project participants	√				1
11. Inadequate training on RC concept	√				1
12. Cultural problems		√			1
13. Potential probity issues		√			1
14. Professional indemnity insurance		√			1
15. Private sector failure			√		1
16. Falling service quality			√		1
17. Political and social obstacles			√		1
18. Lack of well-established legal framework			√		1
20. Non-conducive financial market			√		1
21. Ability to reduce potential competition				√	1
22. Losing control				√	1
Total	10	6	9	4	

Table 6.1 Summary of research investigating the critical success factors (CSFs) for adopting different forms of RC

	CSFs for adopting different forms of RC	Partnering (Chan et al., 2004d)	Alliancing (Xu et al., 2005)	PPP (Li et al., 2005)	JV (Adnan and Morledge, 2003)	Total
1.	Mutual trust	√	√		√	3
2.	Long-term commitment	√		√	√	3
3.	Equitable allocation of risks		√	√		2
4.	Top management support	√			√	2
5.	Willingness to eliminate non-value-added activities	√				1
6.	Early implementation of RC process	√				1
7.	Ability to generate innovations	√				1
8.	Joint problem solution	√				1
9.	Adequate and shared resources	√				1
10.	Clear definition of responsibilities	√				1
11.	Regular monitoring of RC process	√				1
12.	Synergistic strengths and complementarities		√			1
13.	Market demand for services		√			1
14.	Flexibility to change		√			1
15.	Minimum change of top managers		√			1
16.	A strong private consortium			√		1
17.	Available financial market			√		1
18.	Thorough and realistic cost/benefit assessment			√		1
19.	Adequate legal framework			√		1
20.	Local government support			√		1
21.	Stable political and social environment			√		1
22.	Transparent and efficient procurement			√		1
23.	Efficient coordination and cooperation				√	1
24.	Effective and open communication				√	1
	Total	10	6	9	5	

APPENDIX D

Individual Aspects influencing Organizational Behavior

OB Aspects	Definition
Diversity	Surface-level diversity: "Differences in easily perceived characteristics, such as gender, race, ethnicity, age, or disability, that do not necessarily reflect the ways people think or feel but that may activate certain stereotypes." (Robbins & Judge, 2013, p. 43) Deep-level diversity: "Differences in values, personality, and work preferences that become progressively more important for determining similarity as people get to know one another better." (Robbins & Judge, 2013, p. 43)
Personality	"Enduring characteristics that describe an individual's behavior." (Robbins & Judge, 2013, p. 133)
Values	"Basic convictions that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence." (Robbins & Judge, 2013, p. 145)
Emotions and Moods	"Emotions are intense feelings directed to someone or something." (Robbins & Judge, 2013, p. 98) "Moods are less intense feelings than emotions and often arise without a specific event acting as a stimulus." (Robbins & Judge, 2013, p. 98)
Motivation	"Motivation is the processes that account for an individual's intensity, direction, and persistence of effort toward attaining a goal." (Robbins & Judge, 2013, p. 202)
Perception	"Perception is a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment." (Robbins & Judge, 2013, p. 166)
Decision making	"Decision making occurs as a reaction to a problem. That is, a discrepancy exists between the current state of affairs and some desired state, requiring us to consider alternative courses of action." (Robbins & Judge, 2013, p. 174)
Attitudes	"Attitudes are evaluative statements—either favorable or unfavorable—about objects, people, or events. They reflect how we feel about something." (Robbins & Judge, 2013, p. 70)
Stress	"An unpleasant psychological process that occurs in response to environmental pressures." (Robbins & Judge, 2013, p. 595)
Task performance	"Performing the duties and responsibilities that contribute to the production of a good or service or to administrative tasks. This includes most of the tasks in a conventional job description." (Robbins & Judge, 2013, p. 555)
Citizenship behavior	"The discretionary behavior that is not part of an employee's formal job requirements, and that contributes to the psychological and social environment of the workplace, is called citizenship behavior." (Robbins & Judge, 2013, p. 27)
Withdrawal behavior	"Withdrawal behavior is the set of actions that employees take to separate themselves from the organization." (Robbins & Judge, 2013, p. 27)

Group Aspects influencing Organizational Behavior

Organizational Aspects	Definition
Group structure	"We define a group as two or more individuals, interacting and interdependent, who have come together to achieve particular objectives." (Robbins & Judge, 2013, p. 272) "By a formal group, we mean one defined by the organization's structure, with designated work assignments establishing tasks." (Robbins & Judge, 2013, p. 272) "In contract, an informal group is neither formally structured nor organizationally determined. Informal groups are natural formations in the work environment that appear in response to the need for social contact." (Robbins & Judge, 2013, p. 272)
Group roles	"… a set of expected behavior patterns attributed to someone occupying a given position in a social unit." (Robbins & Judge, 2013, p. 277)
Team responsibilities	The state where a team is accountable or to blame for something.
Communication	"Therefore, communication must include both the transfer and the understanding of meaning." (Robbins & Judge, 2013, p. 336)
Leadership	"We define leadership as the ability to influence a group toward the achievement of a vision or set of goals." (Robbins & Judge, 2013, p. 368)
Power and Politics	"Power refers to a capacity that A has to influence the behavior of B so B acts in accordance with A's wishes." (Robbins & Judge, 2013, p. 412)
Conflict and Negotiation	"Essentially, this type of politics focuses on the use of power to affect decision making in an organization or on self-serving and organizationally unsanctioned behaviors." (Robbins & Judge, 2013, p. 424)
Human resource management	"An organization's human resource policies and practices create important forces that shape employee behavior and attitudes." (Robbins & Judge, 2013, p. 566)
Change practices	Practices of making things different (Robbins & Judge, 2013)

Organizational Aspects influencing Organizational Behavior

Organizational Aspects	Definition
Structure	"The way in which jobs tasks are formally divided, grouped, and coordinated." (Robbins & Judge, 2013, p. 481)
Culture	"Organizational culture refers to a system of shared meaning held by members that distinguishes the organization from other organizations." (Robbins & Judge, 2013, p. 512)
Group cohesion	"Group cohesion is the extent to which members of a group support and validate one another at work." (Robbins & Judge, 2013, p. 28)
Group functioning	"Group functioning refers to the quantity and quality if a group's work output." (Robbins & Judge, 2013, p. 28)
Productivity	"An organization is productive if it achieves its goals by transforming inputs into outputs at the lowest cost." (Robbins & Judge, 2013, p. 28)
Survival	"… is simply evidence that the organization is able to exist and grow over the long term." (Robbins & Judge, 2013, p. 29)

APPENDIX E

No reverse-coding

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	38.24	23.968	.470	.423	.640
Q2	39.53	29.324	-.199	.145	.739
Q3	38.28	25.076	.330	.327	.659
Q4	38.87	25.962	.080	.047	.704
Q5	39.20	21.849	.511	.403	.623
Q6	40.18	26.794	.034	.142	.705
Q7	38.32	23.942	.472	.371	.639
Q8	37.96	24.890	.411	.346	.651
Q9	38.40	25.172	.303	.165	.662
Q10	39.32	21.358	.518	.410	.620
Q11	38.63	21.470	.575	.411	.611
Q12	39.08	22.566	.546	.412	.622

Q2 reverse coded

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	38.57	27.453	.540	.423	.698
Q2_R	39.53	29.324	.199	.145	.739
Q3	38.61	28.823	.376	.327	.716
Q4	39.20	30.684	.041	.047	.765
Q5	39.53	25.296	.554	.403	.688
Q6	40.51	31.937	-.041	.142	.769
Q7	38.65	27.711	.504	.371	.702
Q8	38.29	28.737	.446	.346	.711
Q9	38.73	29.237	.311	.165	.723
Q10	39.65	24.925	.545	.410	.689
Q11	38.96	25.307	.575	.411	.686
Q12	39.41	26.064	.595	.412	.687

Q2 and Q6 reverse coded

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	40.20	28.049	.576	.423	.707
Q2_R	41.16	29.439	.274	.145	.740
Q3	40.24	29.061	.461	.327	.719
Q4	40.83	32.337	-.015	.047	.782
Q5	41.16	26.554	.513	.403	.708
Q6_R	40.51	31.937	.041	.142	.769
Q7	40.28	28.608	.502	.371	.715
Q8	39.92	29.292	.494	.346	.718
Q9	40.36	29.970	.332	.165	.732
Q10	41.28	26.173	.506	.410	.708
Q11	40.59	26.260	.564	.411	.701
Q12	41.04	27.264	.555	.412	.705

Q2, Q4 and Q6 reverse coded

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	39.21	28.431	.573	.423	.712
Q2_R	40.17	29.421	.312	.145	.740
Q3	39.25	29.533	.447	.327	.725
Q4_R	40.83	32.337	.015	.047	.782
Q5	40.17	26.869	.517	.403	.712
Q6_R	39.52	31.620	.104	.142	.765
Q7	39.29	28.963	.503	.371	.719
Q8	38.93	29.922	.457	.346	.726
Q9	39.37	30.607	.300	.165	.740
Q10	40.29	26.568	.502	.410	.714
Q11	39.60	26.748	.550	.411	.708
Q12	40.05	27.837	.531	.412	.713

APPENDIX F

Q4 excluded

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	32.88	25.351	.579	.413	.781
Q2_R	33.84	26.761	.264	.106	.816
Q3	32.93	26.539	.432	.301	.795
Q5	33.84	23.499	.558	.390	.780
Q7	32.97	25.673	.530	.371	.785
Q8	32.60	26.659	.473	.343	.792
Q9	33.04	27.246	.320	.167	.805
Q10	33.97	23.089	.552	.407	.782
Q11	33.27	23.354	.594	.411	.775
Q12	33.72	24.297	.592	.403	.777

Q4 and Q6 excluded

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	29.72	21.967	.565	.400	.792
Q3	29.77	23.030	.424	.298	.807
Q5	30.68	20.148	.556	.385	.792
Q7	29.81	22.142	.534	.370	.795
Q8	29.44	23.087	.474	.342	.803
Q9	29.89	23.567	.328	.167	.817
Q10	30.81	19.663	.561	.407	.793
Q11	30.11	19.793	.620	.406	.783
Q12	30.56	20.904	.590	.398	.787

Q2, Q4 and Q6 excluded

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	36.69	26.998	.583	.415	.750
Q2_R	37.66	28.196	.295	.141	.781
Q3	36.75	28.028	.463	.323	.762
Q5	37.66	25.486	.522	.395	.753
Q6_R	37.01	30.520	.073	.120	.807
Q7	36.78	27.479	.515	.371	.757
Q8	36.42	28.300	.486	.345	.761
Q9	36.86	28.988	.322	.167	.775
Q10	37.79	25.082	.516	.409	.754
Q11	37.09	25.205	.572	.412	.746
Q12	37.54	26.254	.556	.410	.750

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.815	.817	9

APPENDIX G

Correlation between Variables

Before conducting the factor analysis, the bivariate correlation matrix should be analyzed to check for multicollinearity. Field (2018) suggests that values which correlate very highly (*r* above 0.80 or 0.90) can be problematic and should be removed. However, as can be seen in Table 12, none of the variables has this correlation coefficient. So, the variables are different and do not measure the same construct.

The adequacy of the sample size can be assessed using the Kaiser-Meyer-Olkin (KMO) test. It represents the ratio of squared correlation between variables to the squared partial correlation between variables (Kaiser & Rice, 1974). A value close to 1 means that factor analysis determines reliable factors. The KMO test of research model is 0.838 (Table 23), which is considered *meritorious* (Field, 2018). Values below 0.50 are unacceptable and should not be used.

The Bartlett's test determines if the correlation matrix is significantly different from an identity matrix (Field, 2018). As can be seen below in Table 23, the test is significant which means that variables are significantly different from zero.

Table 23 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure		.838
Bartlett's Test of Sphericity	**Approx. Chi-Square**	4362.556
	df	66
	Sig.	.000

Factor Extraction

There needs to be decided how many factors should be extracted. The number of factors which should be extracted can be determined using the Kaiser's criterion, a scree plot, and the parallel line test (Field, 2018). The Kaiser's criterion state to retain factors which have an eigenvalue greater than 1 (Kaiser, 1960). As can be seen in Table 24, three factors have an eigenvalue greater than one. However, some researchers state that the KMO-test loses its value with sample sizes exceeding 300 (Field, 2018). Then, the scree plot (Figure 22) is recommended to use. The inflection point at factor number 4 indicates that three factors can be retained.

Parallel to the factor extraction, the threat of common method bias can be checked using the Harman's single-factor test. All variables are analyzed using exploratory or confirmatory factor analysis. It examines the amount of factors that account for the variance in the variables. The technique tests if a substantial amount of common method variance is present within the model (Podsakoff et al., 2003). The Harman's criterion is met if only factor can be derived from the analysis or one of the factors accounts for more than 50% of the variance. As can be seen in Table 24, the questionnaire consists of three factors. The first factor accounts for 31.9% of the total variance and therefore passes the Harman's single-factor test.

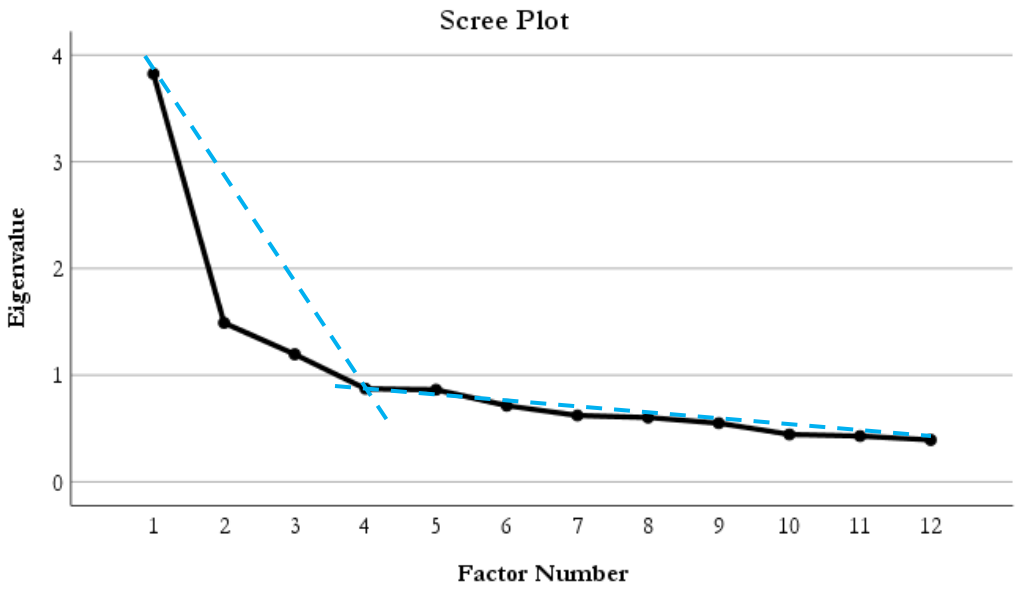

Figure 22 Scree Plot

Table 24 Factor Analysis

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	**Total**	**% of Var.**	**Cum. %**	**Total**	**% of Var.**	**Cum. %**	**Total**	**% of Var.**	**Cum. %**
1	3.825	31.871	31.871	3.825	31.871	31.871	3.010	25.081	25.081
2	1.490	12.414	44.285	1.490	12.414	44.285	2.136	17.798	42.878
3	1.195	9.962	54.247	1.195	9.962	54.247	1.364	11.369	54.247
4	.873	7.271	61.518						
5	.863	7.193	68.712						
6	.714	5.952	74.663						
7	.622	5.183	79.846						
8	.603	5.024	84.870						
9	.550	4.584	89.454						
10	.444	3.703	93.156						
11	.429	3.572	96.728						
12	.393	3.272	100.000						

APPENDIX H

Kruskal-Wallis test for Weeks

Table 25 Hypotheses Tests for Question Differences per Week

Independent-Samples Kruskal-Wallis test

	Null Hypothesis	Sig.	Decision
1	The distribution of Q1 is the same across categories of Week.	.002	Reject the null hypothesis.
2	The distribution of Q2 is the same across categories of Week.	.186	Retain the null hypothesis.
3	The distribution of Q3 is the same across categories of Week.	.005	Reject the null hypothesis.
4	The distribution of Q4 is the same across categories of Week.	.121	Retain the null hypothesis.
5	The distribution of Q5 is the same across categories of Week.	.000	Reject the null hypothesis.
6	The distribution of Q6 is the same across categories of Week.	.000	Reject the null hypothesis.
7	The distribution of Q7 is the same across categories of Week.	.000	Reject the null hypothesis.
8	The distribution of Q8 is the same across categories of Week.	.235	Retain the null hypothesis.
9	The distribution of Q9 is the same across categories of Week.	.139	Retain the null hypothesis.
10	The distribution of Q10 is the same across categories of Week.	.000	Reject the null hypothesis.
11	The distribution of Q11 is the same across categories of Week.	.000	Reject the null hypothesis.
12	The distribution of Q12 is the same across categories of Week.	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05

APPENDIX I

Effect of Week Differences

Table 26 Effect of Week Differences

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Relation	1401	1399	1398	1397	1396	1399	1394	1397	1392	1391	1395	1394
50-51	0.041	0.059	0.045	0.031	0.035	0.037	0.002	0.003	0.048	0.041	0.020	0.040
50-2	0.099*	0.045	0.079	0.018	0.002	0.036	0.073	0.038	0.028	0.028	0.086	0.009
50-3	0.112*	0.024	0.101*	0.002	0.078	0.035	0.070	0.023	0.018	0.032	0.037	0.047
50-4	0.082	0.027	0.101*	0.024	0.134*	0.085	0.000	0.008	0.072	0.066	0.020	0.121*
50-5	0.077	0.048	0.082	0.026	0.109*	0.078	0.000	0.044	0.013	0.038	0.008	0.069
50-6	0.085	0.031	0.093*	0.020	0.035	0.064	0.029	0.061	0.048	0.011	0.072	0.028
50-7	0.092*	0.062	0.063	0.022	0.015	0.021	0.018	0.029	0.045	0.025	0.023	0.003
50-8	0.087	0.016	0.046	0.024	0.010	0.018	0.029	0.028	0.025	0.002	0.028	0.035
50-9	0.083	0.008	0.093*	0.007	0.101*	0.013	0.014	0.037	0.031	0.012	0.005	0.038
51-2	0.064	0.015	0.038	0.052	0.040	0.000	0.082	0.039	0.020	0.075	0.072	0.053
51-3	0.078	0.041	0.060	0.033	0.046	0.004	0.080	0.023	0.035	0.011	0.018	0.006
51-4	0.042	0.042	0.058	0.011	0.107*	0.050	0.003	0.006	0.022	0.024	0.047	0.087
51-5	0.037	0.018	0.037	0.066	0.079	0.043	0.002	0.045	0.042	0.007	0.033	0.029
51-6	0.049	0.032	0.052	0.055	0.000	0.030	0.034	0.064	0.000	0.057	0.056	0.013
51-7	0.059	0.006	0.023	0.008	0.019	0.015	0.022	0.029	0.000	0.069	0.004	0.044
51-8	0.054	0.039	0.006	0.055	0.023	0.054	0.033	0.028	0.018	0.037	0.010	0.001
51-9	0.046	0.058	0.051	0.043	0.072	0.028	0.013	0.038	0.019	0.033	0.028	0.003
2-3	0.009	0.025	0.020	0.022	0.087	0.004	0.007	0.018	0.013	0.067	0.057	0.061
2-4	0.030	0.025	0.015	0.048	0.149*	0.049	0.089*	0.038	0.045	0.107*	0.126*	0.144*
2-5	0.034	0.001	0.005	0.008	0.121*	0.042	0.088*	0.002	0.019	0.076	0.111*	0.087
2-6	0.017	0.017	0.013	0.002	0.040	0.029	0.049	0.024	0.020	0.019	0.017	0.041
2-7	0.002	0.020	0.013	0.041	0.019	0.015	0.055	0.008	0.019	0.002	0.064	0.006
2-8	0.003	0.026	0.027	0.008	0.013	0.053	0.039	0.007	0.000	0.029	0.053	0.046
2-9	0.022	0.042	0.011	0.012	0.112*	0.027	0.098*	0.003	0.002	0.045	0.103	0.052
3-4	0.043	0.002	0.006	0.026	0.060	0.057	0.087	0.020	0.062	0.038	0.070	0.084
3-5	0.047	0.027	0.027	0.033	0.032	0.050	0.085	0.022	0.006	0.006	0.055	0.024
3-6	0.028	0.008	0.007	0.025	0.047	0.035	0.045	0.044	0.035	0.048	0.040	0.019
3-7	0.011	0.045	0.032	0.022	0.063	0.012	0.051	0.008	0.033	0.061	0.013	0.051
3-8	0.011	0.005	0.046	0.028	0.063	0.052	0.035	0.009	0.011	0.028	0.005	0.006
3-9	0.033	0.018	0.009	0.010	0.027	0.025	0.096*	0.016	0.016	0.023	0.049	0.010
4-5	0.005	0.027	0.023	0.063	0.030	0.007	0.000	0.045	0.073	0.034	0.015	0.064
4-6	0.012	0.007	0.001	0.051	0.109*	0.018	0.035	0.066	0.023	0.088*	0.110*	0.102*
4-7	0.026	0.045	0.028	0.001	0.120*	0.063	0.022	0.026	0.020	0.097*	0.047	0.128*
4-8	0.023	0.007	0.043	0.050	0.116*	0.101*	0.034	0.025	0.039	0.060	0.051	0.075
4-9	0.008	0.022	0.004	0.036	0.031	0.083	0.017	0.036	0.045	0.062	0.017	0.094*
5-6	0.016	0.017	0.019	0.006	0.080	0.011	0.035	0.025	0.042	0.056	0.095*	0.043
5-7	0.029	0.023	0.010	0.052	0.094*	0.056	0.022	0.011	0.039	0.069	0.034	0.074
5-8	0.026	0.027	0.025	0.003	0.092*	0.095*	0.033	0.009	0.016	0.034	0.039	0.026
5-9	0.012	0.046	0.017	0.022	0.003	0.075	0.017	0.006	0.022	0.030	0.003	0.034
6-7	0.014	0.036	0.025	0.044	0.019	0.043	0.010	0.031	0.001	0.016	0.048	0.032
6-8	0.012	0.012	0.039	0.007	0.023	0.081	0.004	0.028	0.018	0.012	0.039	0.010
6-9	0.004	0.026	0.002	0.014	0.073	0.059	0.048	0.029	0.019	0.026	0.087	0.010
7-8	0.001	0.043	0.014	0.045	0.004	0.038	0.012	0.001	0.018	0.026	0.006	0.038
7-9	0.018	0.061	0.024	0.031	0.087	0.010	0.035	0.006	0.018	0.040	0.030	0.042
8-9	0.016	0.010	0.038	0.020	0.086	0.032	0.045	0.005	0.002	0.009	0.035	0.002