Inducing change in a conservative industry

The effects of simulation gaming on behavioural change in the construction sector

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Colophon

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Preface

This master thesis was written to complete the master study Construction Management and Engineering at the University of Technology of Delft. The research was conducted in collaboration with Company X. Company X is a company within a large construction organization (Organization Z) existing out of multiple construction companies. The organization takes on a wide range of construction projects. A group of these construction companies works on the infrastructural projects, Company X carries out the management of these infrastructural projects.

Together with supervisors of Company X, a graduation research into the effects of a simulation game on the behaviour of the employees was designed and executed. Special thanks to these supervisors. Not only the supervisors, but many other people from Company X and the wider construction organization contributed to this research with their knowledge and time. In this preface I would also like to thank all these people for their help and contributions.

Furthermore, I would like to thank all supervisors from the TU Delft, Hans Bakker, Louis Lousberg and Wijnand Veeneman. They supported me during this research and guided me towards the end result.

I wish you a pleasant read.

Hilde Eijkelkamp

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Executive summary

Background information

In this thesis report created to graduate from the master Construction Management and Engineering at the Delft University of Technology, the effects of a simulation game on the behaviour of the employees of a construction company are determined. This research was conducted at Company X. Company X is a company within a bigger construction organization existing out of multiple construction companies. From now on this organization will be called organization Z. The organization carries out a wide range of activities, from civil engineering to railway construction and from the construction of non-residential buildings to telecom. Company X is responsible for the project and process management on the infrastructural projects within this organization.

About 30 years ago engineers employed by Rijkswaterstaat designed infrastructure (roads, bridges, locks) into detail. After the closedown of this engineering service, Rijkswaterstaat started to only give a list of functional specifications for design to the construction companies, which means that the design responsibility was entirely given to the contractor. In the same time, the increasing number of travellers made that infrastructural projects became more and more complex. As a result, assignments for infrastructural projects became less specific and increasingly complex at the same time. The specialised knowledge of the construction companies was not sufficient to draw a proper design for these assignments. As a result, construction companies had to join forces and work together to be able to deliver the infrastructural projects. However, certain characteristics of the construction industry make it difficult for the companies in the sector to implement changes.

Company X is also struggling with these changed building assignments. The trends in the construction sector have already had their impact on their infrastructural projects. Currently, the costs of failure are high on the integral, infrastructural projects of Organization Z. To make the projects successful again, more successful teamwork has to be shown. Company X plans to create this with the help of intervention Y. The intervention exists of a program that uses presentations and a simulation game (which will be called game X form now on) to propose structural changes to the project structure and behavioural changes on the side of the employees of organization Z. Eventually, a behavioural change on the side of the project team members into behaviour that better supports successful teamwork is pursued.

Problem description, research objective and research question

From literature it became clear that a simulation game is a tool that can successfully contribute to a behavioural change. However, it was found that no empirical research was conducted into the application of simulation games to a behavioural change process in the construction industry. The change obstructing characteristics of the construction sector make it seem too blunt to assume that the application of a simulation game in a construction company would have the same positive effects on behavioural change as it has in other industries. This means that the applicability of simulation gaming to induce behavioural change in a construction organization remains a knowledge gap. This knowledge gap poses a problem that makes it difficult for companies like Company X, that would like to apply a simulation game to implement an intervention.

Empirical knowledge is needed to fill the gap and provide Company X with recommendations for improving their intervention. Therefore, the goal of this research is to fill the knowledge gap, by conducting empirical research in order to produce knowledge about the extent to which a simulation game can be effective to induce a behavioural change in a construction company.

With the knowledge that is obtained in this way, recommendations towards Company X can be determined. To be able to produce recommendations that are useful for Company X the empirical research can best be focused on the effectiveness of the simulation game X. The question that should be answered in the empirical research, therefore, has to be as follows: 'Is a simulation game like game X an effective tool to induce a behavioural change amongst employees of a construction company?'

Theoretical framework

As indicated in the literature, different theories as to what induces behavioural change, exist. In the behaviouristic approach, people believe that environmental factors solely change behaviour. These environmental factors form incentives for people to adjust their behaviour (like speeding tickets or lowering prices of goods). In this theory, there is no room for self-governance. In the cognitive psychology, this self-governance explains behaviour and behavioural changes. According to this theory, behaviour is formed by people's intentions, beliefs, attitudes and values. These beliefs and intentions can be changed by dissonance (letting people act differently, which causes them to see the advantages of this new behaviour and change their attitude towards it which then could lead to a behavioural change) and persuasion (persuade people that another behaviour is better by using words). However, according to the literature, attitude change appears to have a very weak influence on behaviour. The dual-system theory states that a long-lasting behavioural change best is created when aspects of both of these approaches are combined.

Simulation games, dynamic models of the real world in which participants can safely learn and experiment with skills they can use in the real world, use cognitive elements, the so-called mirror and window effects, to induce behavioural change amongst participants. This means that a simulation game influences behavioural change through the adjustment of personal beliefs. A simulation game is effective when it creates enough persuasion or dissonance for personal beliefs to change in such a way that behavioural change follows. The simulation game X is considered to be effective when it creates such an increase in awareness amongst the participants of the need for a behavioural change, that a shift occurs from behaviour that obstructs successful teamwork towards behaviour that supports this. From literature, behaviours that obstruct successful teamwork and behaviours that support successful teamwork were determined. To establish the effectiveness of game X, the existence of behaviours that support or obstruct successful teamwork and the extent to which participants are aware of the need for a behavioural change should be measured before and after the game is played. Developments in this behaviour and awareness have to be linked to the application of the game.

Technical research design

In this research interviews were conducted with participants before and after they played the game to establish the before and after situation in which they find themselves. The way in which quantitative data from questionnaires (after the game in the form of action-lists) supports these interview findings were discussed and representativeness of these findings was considered. By comparing the before and after situation, developments in behaviour and attitude could be determined. Observation during the game is used to establish whether or not the developments that are found in behaviour and attitude can be linked to the application of the game. The qualitative information gathered with the help of the interviews could help in determining recommendations towards Company X to improve their intervention and state alternative solutions.

Results

From the interviews and questionnaires, it became clear that a lot of behaviours that obstruct successful teamwork are shown before the game is played. The obstructing behaviours that are shown most often are:

- Setting unclear goals
- Drop others
- Being unclear and vague
- Making mistakes over and over again

Respondents appear to be most aware of a need for behavioural change on these behaviours. However, they are not aware of the way in which they could improve the behaviour 'being unclear and vague'. For the other behaviours they are aware what behaviour should be expressed to improve them. Furthermore, participants seem to be unaware of the need for considering the behaviours within the success factor 'showing initiative' to create successful teamwork. These findings were supported by findings from the questionnaire, which means that is assumed that these behaviours and attitudes also exist within most other project teams.

From the interviews and questionnaires (action-lists) that were conducted after the game was played, was determined that, in the six months that this research lasted, no clear development in behaviour on the projects occurred. However, participants did become more aware of the fact that the 'obstructing' behaviour 'waiting' was shown too much on the projects and that they have to undertake initiatives themselves when successful teamwork is pursued.

Most participants undertook initiatives that have to do with implementing another structure on the projects, which does not include a behavioural change. It could be assumed that most participants understand that they have to undertake initiatives themselves, but are still not aware of the need for a behavioural change and thus aim their initiatives towards a structural rather than a behavioural change. Despite this, there are also participants that determine initiatives to improve communication skills. These participants thus became aware of what they could do to change their behaviour. These findings were supported by findings from the action-lists, which means that is assumed that these developments in awareness also exist within most other project teams.

From observing the game was learned that it could be assumed that the abovementioned developments in attitude were caused by the application of the game.

Conclusion and recommendations

This research is concluded by stating that the simulation game X is not considered an effective tool to induce a behavioural change amongst employees of a construction company. This answer was given for two reasons:

- A general behavioural change on the projects did not occur
- Only an increase of awareness of the need for a behavioural change occurred amongst a part of the participants.

However, the game did influence the awareness of a part of the participants of the need for a behavioural change and the actions that should be undertaken to initiate this. Therefore, for these participants the simulation game can be considered partly effective.

To increase the effectiveness or consider alternative solutions, recommendations have to be presented to Company X. During this research, information was gathered that could help to determine these recommendations.

Recommendations that were presented to Company X and that include ways in which the effectiveness of the simulation game could be increased were:

- Combine the simulation game with a change in environmental factors to increase the chance of a behavioural change.
- Determine exactly what behaviours should be changed with the help of the simulation game and adjust the game to address these behavioural changes.
- Make clear to the participants during day two what the desired behaviour is and why this is needed, with the help of the window effect. This could best be done with the help of lectures that interrupt the game-play, just like is done during day one.
- Shorten the presentations prior to the game or move certain presentations to another time to minimize the information that is received by the participants. Make sure that the presentations also show the need for a behavioural change on the projects instead of only the needed new structure.

Recommendations that were presented to Company X and that include alternative solutions to create successful teamwork were:

- Revise the structure of the projects of Organization Z and consider a 'shared wallet' solution.
- Give it time and conduct another research into the existence of a behavioural change in the future.
- Create more places where project team members can work together. Design these work places in such a way that it stimulates communication.
- Create a good system to share information with each other.

Also, it was recommended to investigate what happens if more people have played the game. A research in which project teams are observed throughout the entire process (before, during, after the game) was recommended to investigate this. Furthermore, it was recommended to conduct further research into the application of other simulation games to different construction companies. By comparing the results of the different cases, the real effects of simulation games on behaviour in construction companies can become clear.

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Glossary

Intervention   Action undertaken to change the way of working in an organization. In this research Intervention Y is subject of investigation

Body of knowledge   Complete set of concepts, terms and activities that make up a professional domain, as defined by the relevant learned society or professional association

Integral projects   Projects in which a lot of different disciplines are involved that have to work together and have to take all other project phases into consideration

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Part I
Conceptual design

In this first part of the research report, the content of the research to be conducted is modelled. This means that in this part the problem context and problem description are described. Also, the research objective and research question are defined. A broad research framework explains the general structure of this research. With help of a literature study the research question is made more specific and sub-questions are defined.

Chapter 1 Introduction

In this chapter, the content of this research will become clear. The chapter starts with two paragraphs on background information which state the context of the problem. The actual problem is explained in the third paragraph. Subsequently, based on this problem the goal and the research question of this research are stated. After that, the general research structure that will be used in this research is determined. The chapter ends with the thesis outline in which the structure of this report is disclosed.

1.1 Background information

The body that is responsible for providing dry feet, sufficient clean drinking water and smooth and safe traffic in the Netherlands is 'Rijkswaterstaat': the executive agency of the Ministry of Infrastructure and Environment in the Netherlands. About 30 years ago, engineers employed by Rijkswaterstaat designed infrastructure (for instance roads, bridges, locks) into detail. After they designed and specified the infrastructure, the execution of the design was divided into parts and tendered and awarded to contractors. This division resulted in a situation in which, for instance, all the asphalt activities were awarded to one contractor that had a lot of knowledge on asphalt construction and all the concrete activities were awarded to a contractor with a lot of knowledge on concrete structures. These contractors then all received a design and specifications for their part of the project-scope (Baron, 1986; 2017).

This all changed when, under the influence of cuts in the budget, the engineering service at Rijkswaterstaat was closed down. From that moment onwards, contractors only received a list of functional specifications for design from Rijkswaterstaat, which means that they obtained full design responsibility. However, the increasing number of travellers made that the assignments became more complex at the same time. The specialised knowledge of the construction companies was not sufficient to draw a proper design for these complex assignments. This made combination of the specific knowledge from the construction companies necessary, which means that more teamwork between these companies was needed (Baron, 1986).

However, the construction industry has difficulties changing its way of working. Up until the 'Construction Fraud' (revealed in 2002), the construction sector was supported by politics. This made that the construction companies never really had to worry about their environment, the future and the other sectors. A lot of specialised technical knowledge was enough to do a good job and the industry became short-sighted and internally orientated. Because of the lack of a long-term vision and insights into trends and changes in the environment of the sector, a conservative industry developed. This characteristic makes it difficult for the companies in the construction industry to implement changes (Rietdijk, 2009).

1.2 The Company X approach

A construction company that is struggling with the changed building assignments is Company X. Company X is a company within a bigger construction organization existing out of multiple construction companies (Organization Z). The construction companies within this organization work together to take on tenders of big construction projects. Company X is responsible for the project and process management on the infrastructural projects within this organization.

The changed building assignments have had their impact on the integral infrastructural projects of Organization Z. Currently, costs of failure on these projects are high. Apparently, the project teams of Organization Z, existing out of employees from the different specialised construction companies within the organization, do not succeed in delivering successful projects.

To make the projects successful again, more successful teamwork has to be shown. To create this, a structural, as well as a behavioural change on the side of the employees is needed. With the help of Intervention Y, Company X plans to induce these changes.

1.2.1 Intervention Y

The intervention exists out of a program that proposes structural changes to the project structure and behavioural changes on the side of the employees of Organization Z. It involves presentations in which Company X presents the new project structure. Next to these presentations the intervention also involves a simulation game, called Game X, that is used to teach the employees how to work with the new project structure and to make them aware that a change in behaviour is necessary to support this new project structure. Also, a coming-back moment is planned for every group that plays the game, a month after they played it. During this coming-back moment they discuss the actions they undertook to improve successful teamwork. Eventually, a behavioural change on the side of the project team members into behaviour that better supports successful teamwork is pursued.

1.2.2 Game X

In Game X a real-life integral project in which different construction companies work together to achieve a common goal is simulated as follows:

- The group gets the assignment to build a hydrogen plant
- This plant will be constructed by two fictive companies, a water company and an air company
- The participants all get functions in either one of the two companies or in the umbrella organization of the project. The functions are assigned by the game-leaders. The functions that exist in the game are shown in the scheme in Figure 1.
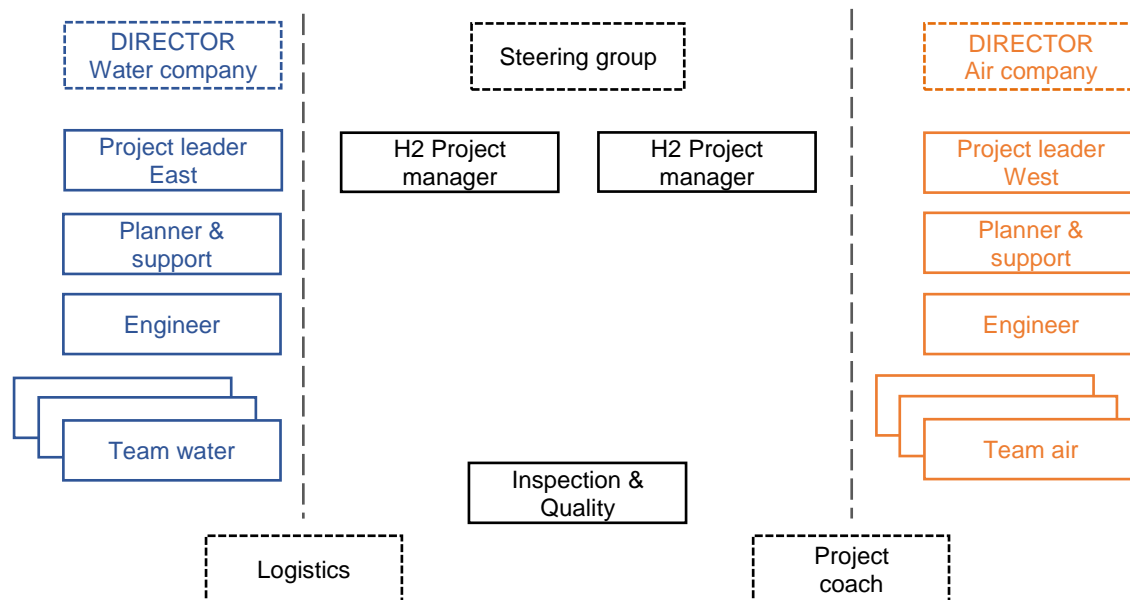
Figure 1. Division of functions in Game X

The functions on the left of the scheme belong to the Water company, the functions on the right to the Air company. The functions in the middle belong to the umbrella organization of the project. The game-leaders perform the functions that are marked with a dotted line. The participants thus get assigned one of the functions that are delineated with a solid line.

During the game the participants are encouraged to develop the hydrogen plant in different phases, using the gate reviews that are an essential part of the project structure that Company X promotes with this intervention. By creating teams in which participants from both companies are mixed, the participants are stimulated to work successfully together with employees from the other fictive company. This team composition is shown in Figure 2.
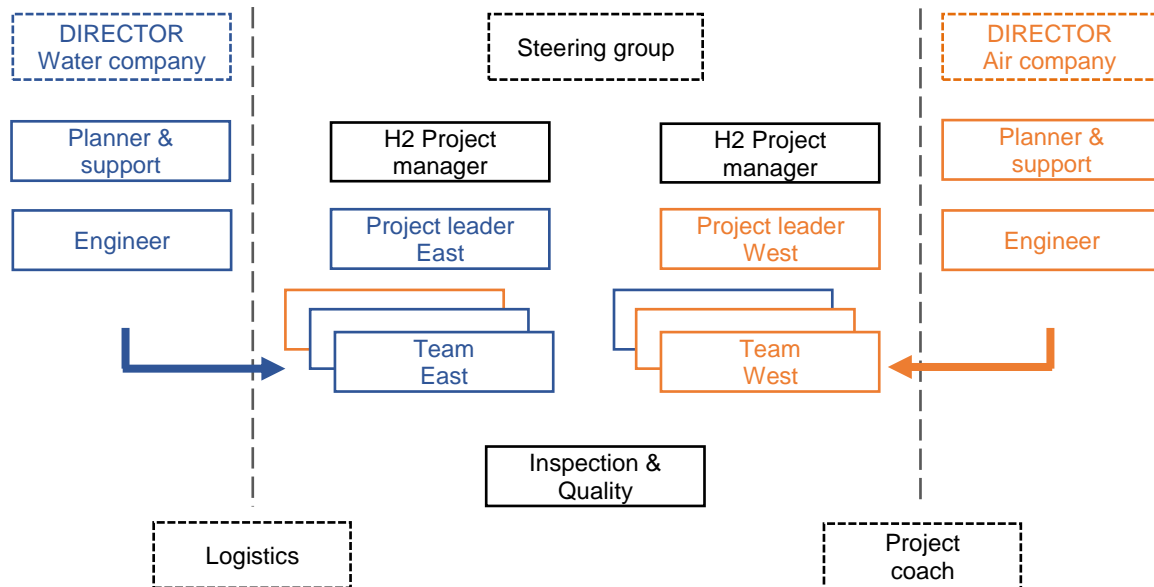
Figure 2. Team composition within Game X

The two teams then both have to develop one part of the plant. However, of course, there are a lot of common grounds between the two parts of the plant, which makes that successful teamwork between these two teams is needed.

The first day of the game is about designing and planning the development of the hydrogen plant. At the end of day one, a planning has to be handed in, as well as orders for materials that are needed to build the plant on day two. During day two, the materials are delivered, and the group can start building the plant. A strict time is set at which the plant has to be delivered to the client and water and air have to run through the plant. The game ends with a debriefing session in which the lessons that the participants learned from the game are discussed. Also, actions are determined that participants would like to undertake in the future to create successful teamwork. During the earlier mentioned coming-back moment the execution of these actions is discussed.

At several moments during day one, the game is briefly interrupted with short lectures. These lectures explain why gate reviews are necessary and how they can be applied. After the lectures, the participants can bring their new knowledge to practice in the game. The alternation of lectures and practice enhances the learning aspect of the game. This first day of the game is, therefore, mostly about learning how to work with the gate reviews.

During day two, the game is structured in such a way that participants start to show the behaviour that they also show on the projects in real-life. Because of the structure of the game the consequences of this behaviour are enlarged and really sensible to the participants.

This second day, therefore, is about showing what behaviour has positive and what behaviour has negative consequences and about increasing the awareness amongst participants that a behavioural change on the projects is necessary. With help of the debriefing session, the game also makes clear what actions could be undertaken to improve successful teamwork on the projects.

Eventually, this game should contribute to a behavioural change on the side of the employees of Organization Z. To contribute to this change, the purpose of the game is on the one hand to make employees aware of the negative consequences of their behaviour and what they can do to improve successful teamwork. On the other hand, it suggests a new project structure which should be used to support this behavioural change.

1.3 Problem description

According to De Caluwé et al. (1996) simulation games are excellent instruments to realise goals that have to do with learning and change processes. In this book they discuss different change processes in organizations that were induced with help of a simulation game. The book concludes with stating that simulation games are best appreciated when applied in change processes that include a reflection by participants on their behaviour and attitude. In other words, the book describes empirical researches on the basis of which it establishes that a simulation game is a well-suited tool to help in behavioural change processes. Other sources also provide empirical evidence for the applicability of a simulation game in behavioural change processes (Caluwé, 2007; Duke & Geurts, 2004; Hofstede, Caluwé, & Peters, 2010).

However, none of the cases described in literature concern a construction company. Literature does not provide empirical evidence that determines the effectiveness of applying a simulation game in behavioural change processes in the construction industry. With the beforementioned characteristics of the construction culture that obstruct change in mind, it would seem too blunt to assume that applying a simulation game in a construction company would yield the same positive effects on behavioural change as it has in other industries according to literature. The applicability of simulation gaming to induce behavioural change in a construction organization remains a knowledge gap. This knowledge gap poses a problem that makes it difficult for construction companies that would like to apply a simulation game, like Company X, to improve their intervention. Understanding the effectiveness of applying a simulation game to induce behavioural change in the construction industry is relevant from a research point of view, and can help construction companies to improve their interventions.

1.4 Research objective

As it became clear from the problem description, the applicability of a simulation game to induce behavioural change in the construction industry remains a knowledge gap. When Company X would like to improve Intervention Y, which involves a simulation game, this knowledge gap forms a problem. Empirical knowledge is needed to fill this gap and provide Company X with recommendations for improving the intervention. Therefore, the goal of this research is to fill the knowledge gap, by conducting empirical research in order to produce knowledge about the extent to which a simulation game can be effective to induce a behavioural change in a construction company.

1.5 Research question

The empirical research that was suggested in the research objective should focus on establishing the effectiveness of applying a simulation game to induce a behavioural change in a construction organization. With the knowledge that is created in this way, recommendations towards Company X can be determined.

To be able to produce recommendations that are useful for Company X, the empirical research can best be focused on the effectiveness of Game X. The question that should be answered in the empirical research, therefore, has to be as follows:

'Is a simulation game like Game X an effective tool to induce a behavioural change amongst employees of a construction company?'

1.6 Research framework

To be able to answer this research question and state recommendations towards Company X based on this answer, certain steps will have to be undertaken. In the research framework in Figure 3 these steps are shown.
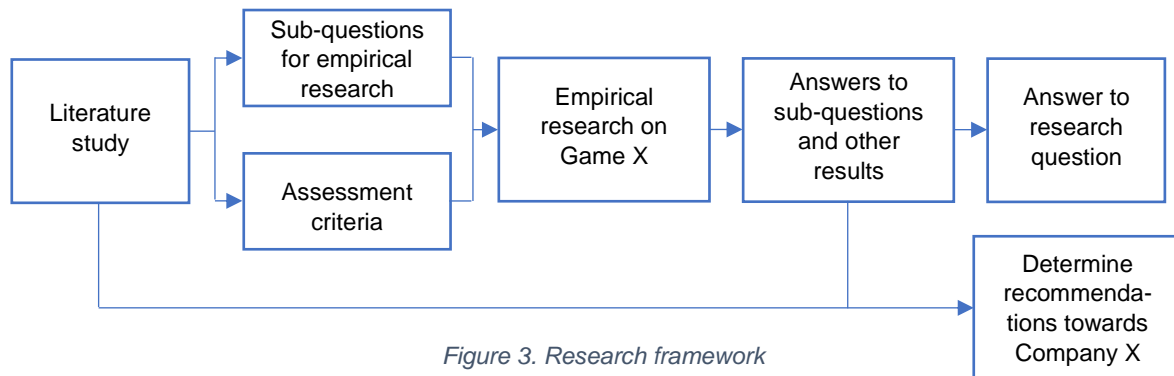
Figure 3. Research framework

In fact, a research framework is a schematic representation of the research objective. It includes all the steps that need to be followed to achieve this objective. The steps in this research are as follows:

- First, the specific content of the empirical research has to be defined. Also, the researcher has to make sure when a simulation game is considered effective. In other words, the sub-questions to answer in the empirical research and the assessment criteria that have to be used to determine the effectiveness of a simulation game have to be developed. Information to establish these can be derived from literature. Therefore, the research starts with a literature study.
- From this literature study the sub-questions and assessment criteria can be determined.
- Based on these questions and criteria the empirical research on Game X can be conducted.
- With the help of the results of this empirical study, answers to the sub-questions can be determined.
- The answers to these sub-questions help to answer the research question of this research which examines the effectiveness of Game X.
- To be able to state recommendations towards Company X about their intervention, it is needed to know why the simulation game is considered to be effective or not. The empirical research could yield extra results that do not directly contribute to answering the sub-questions, but that do provide information that explains the effectiveness of the simulation game. These results could be used together with the information from the literature study to explain the effectiveness. Based on this information recommendations can thus be drawn.

1.7 Report outline

This research consists out of four parts. In this first part, called 'Conceptual design', the content of the research to be conducted is modelled. It started with a definition of the project context and the problem to which's solution this research will contribute. Also, the research objective and question were defined. In the previous paragraph, the steps that will be undertaken in this research were laid down in a research framework. This part will continue to model the content of this research into more detail, by defining the sub-questions and assessment criteria that will be used to answer the research question. This is done with the help of a literature study. The literature study and the definition of the sub-questions and assessment criteria are discussed in Chapter 2.

The second part of this research, called 'Technical design', consists of the decisions concerning how, where and when the research is going to be conducted. In this part a technical research design that would theoretically fit this research best is determined in Chapter 3, by determining the best fitted research approach and methods for data gathering. In Chapter 4 limitations to the application of this technical research design are discussed and the modified technical research design that is used in this research is determined.

The name of the third part 'Results and analysis' already gives away what this part is about. In Chapter 5, Chapter 6, Chapter 7 and Chapter 8 the data that was gathered with the help of the different methods are stated and discussed. In Chapter 5, Chapter 6 and Chapter 7 this data is used to answer the sub-questions of the research. In Chapter 8 the data that could be used to explain the effectiveness of the game and to state recommendations towards Company X is discussed.

In the last part of the research, called 'Discussion', conclusions are drawn from the results and analyses. In Chapter 9 the answers that were given to the defined sub-questions are combined to answer the research question. Eventually, in Chapter 10 recommendations for improving Intervention Y towards Company X are provided. Chapter 11 discusses the limitations of this research and provides the reader with a reflection on what different results could have been obtained if other or more possibilities would have been present.

This report ends with a list of references and appendices.

Chapter 2 Theoretical framework

In this chapter, the literature study preceding the empirical research is stated. Relevant literature forms a theoretical framework that can help in determining the exact content of the empirical research. Literature is considered to be relevant when it can help to determine ways in which the research objective can be achieved, and the research question can be answered.

The research question that has to be answered in this research was stated as follows:

'Is a simulation game like Game X an effective tool to induce a behavioural change amongst employees of a construction company?'

To be able to answer this question, first, more information is needed about the concepts 'behavioural change' and 'simulation gaming'. With the help of this information, the ways in which simulation games could contribute to behavioural change can be established. Therefore, this chapter starts with a paragraph on the mechanisms of behavioural change, followed by a paragraph that explains and defines the concept 'simulation gaming'. In the third paragraph, the way in which simulation games can help to create behavioural change is established. The application of this theory to Game X is described and assessment criteria that should be used to determine the effectiveness of a simulation game in a behavioural change process are determined. In the fourth paragraph, the form these criteria have to take to establish the effectiveness of Game X is determined. The chapter is concluded by describing the set of sub-questions that should be answered based on the information from this chapter.

2.1 Behavioural change

Multiple theories exist on what induces behavioural change. In this literature study, the behaviouristic and cognitive theory are discussed as well as the dual-system theory, in which the other two theories are combined. These theories were chosen because of the big contrast between the behaviouristic and cognitive theory, which illustrates the wide variety of factors that could influence behaviour. Simulation gaming lies at one end of this spectrum, but to be able to give recommendations about the entire intervention, knowledge of the bigger spectrum is needed. In the following sections, the different theories are explained. The sections all end with a schematic representation of the mechanisms in the theories.

2.1.1 Behaviouristic theory

The behaviouristic psychology uses environmental factors to explain behaviour and behavioural change. In their theory human behaviour is shaped by incentives from the direct environment: the context. These incentives can precede the behaviour (antecedents) and can follow the behaviour (consequences). Here follows an example of how behaviour is formed by these two kinds of incentives: a traffic light turns to green (antecedent), the motorist pushes the gas paddle (behaviour), and the car starts moving (consequence). In behaviouristic psychology, behaviour is seen as a function of the incentives that precede and follow it (Tiggelaar, 2010).

Antecedents and consequences can be inherent to the behaviour (as the car moves when the gas paddle is pushed in the example), but they can also be linked explicitly to certain behaviour to stimulate or to discourage it. In this way, the behaviour 'driving too fast' is followed by the consequence of a fine, which discourages this behaviour. Making tickets to museums cheaper for students is a precedent to stimulate students to go to a museum. These antecedents and consequences are present in our entire society. The mechanism of behavioural change according to the behaviouristic theory is shown in Figure 4 on the next page (Tiggelaar, 2010).
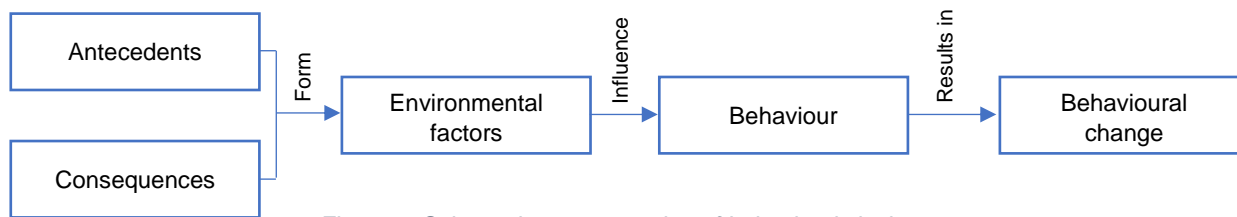
Figure 4. Schematic representation of behaviouristic theory

According to the behaviouristic psychology, these environmental factors define the whole spectrum of human behaviour. This means that in this theory, there is no place for self-governance: being able to choose what behaviour you show. This directly forms a disadvantage of this theory (Tiggelaar, 2010, pp. 18-20).

2.1.2 Cognitive theory

The cognitive psychology uses, instead of the environmental factors, self-governance to explain behaviour and behavioural change. The cognitive theory rose as a reaction to the behaviouristic approach in which there was no room for internal beliefs and attitudes and in which only the environment could influence behaviour. This makes the two theories each other's opposites. In the cognitive theory people believe that human behaviour is determined by people's intentions, beliefs, attitudes and values. People develop these on the basis of information they receive from own experience or from other people. Behavioural change in this theory is achieved by changing one's attitude and beliefs (Tiggelaar, 2010, pp. 20-22).

According to Baron (1986), attitudes can be changed by persuasion and dissonance. Dissonance has to do with first changing behaviour (by for instance using a role play). By performing different behaviour, people realise that this other behaviour would fit the environment better. This makes them change their beliefs and attitudes towards this new behaviour, which would eventually result in behavioural change (Baron, 1986, pp. 141-149). Persuasion means that persuasive messages are used to make the receiver believe that other behaviour fits the environment better. This could lead to a change in attitude concerning this behaviour and would eventually result in a behavioural change (Tiggelaar, 2010, pp. 20-22). The mechanism of behavioural change according to the cognitive theory is shown in Figure 5.
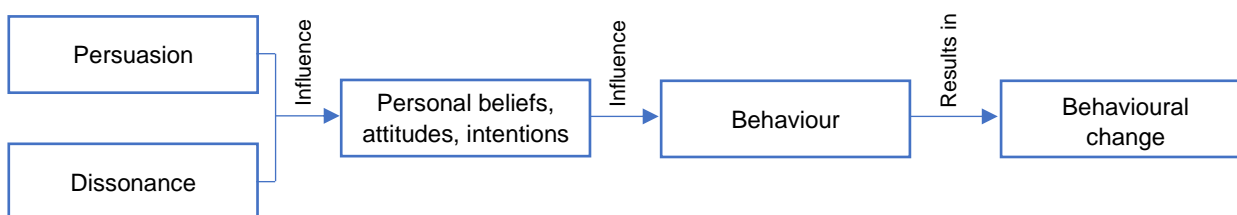
Figure 5. Schematic representation of cognitive theory

From research it became clear that there is a weak relationship between attitudes and behaviour, which forms a disadvantage of this theory. Substantial changes in attitude seem to lead to very weak changes in behaviour. Janis & King (1954) and Janis & Mann (1965, 1968) showed in research that behavioural change even has more effect on attitude change than vice versa. Moreover, they show that behavioural change lasts longer when behaviour is changed first (for instance because of imposed rules) than when the attitude is changed first. Wilson, Lindsey & Schooler (2000) showed in research that attitudes do not determine behaviour stably and autonomously. Instead, attitudes are temporary states of mind which depend on contextual factors. A change in attitude is therefore often not stable enough to also create a change in behaviour.

2.1.3 Dual-system theory

Two theories for explaining behaviour and behavioural change were discussed. Both approaches have their downsides. The behaviouristic theory lets no room for internal beliefs and attitudes that could influence behaviour. The cognitive approach does not seem strong because of the weak causal link between changing attitudes and behaviours. Next to this, these theories do not have an answer to a problem that was not discussed before. This issue constitutes the fact that people sometimes experience a contradiction between the choices they make and the behaviour they show. Here external factors for influencing behaviour according to the behaviouristic theory, and internal attitudes on which behaviour should be based according to the cognitive theory, conflict. This makes that people could show behaviour that does not correspond with one of these two influential factors (Tiggelaar, 2010, pp. 22-26).

The problem that was described above is solved in the dual-system theory. In this approach behaviour is a result of influences of environmental factors on the one hand and of conscious choices on the other hand. In combining these aspects, the dual-system theory leaves room for own interpretation as well as for influences from the environment. The combination of these aspects appears to have a strong effect. According to Tiggelaar (2010), long-lasting behavioural changes are created when both cognitive and behaviouristic aspects are used. Figure 6 shows he mechanism of behavioural change according to the dual-system theory.
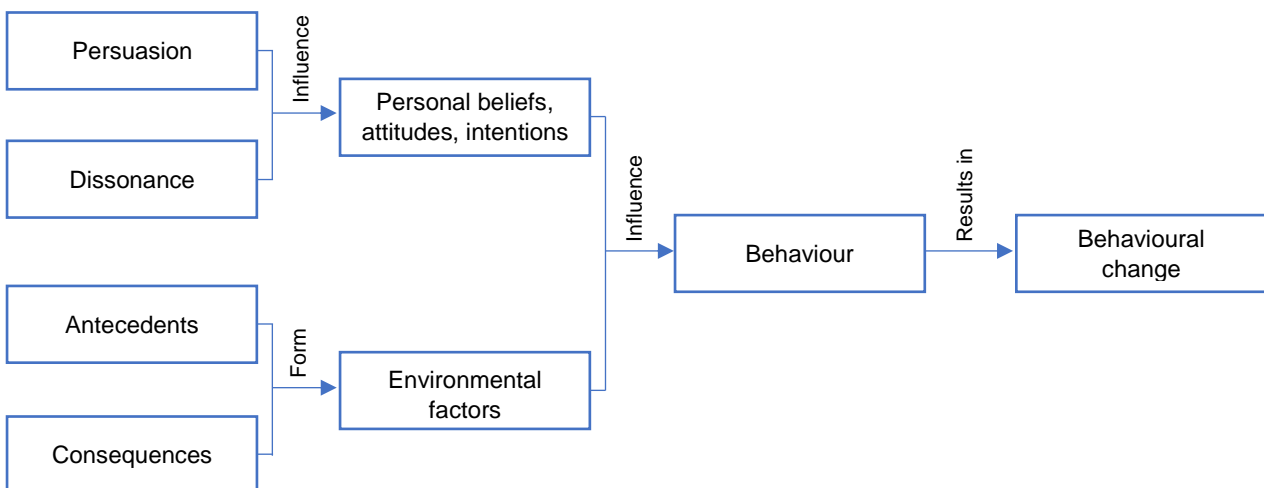
Figure 6. Schematic representation of dual-system theory

2.2 Simulation gaming

The concept 'simulation gaming' can be explained by the definitions of the concepts 'game' and 'simulation'. In the following paragraphs, these concepts will be explained. This section ends with a paragraph in which the definitions of 'game' and 'simulation' are put together to define the concept 'simulation gaming'.

2.2.1 Games

Games are present throughout the entire life of people. Children's games are the first forms of games with which people become familiar in their lives. Also, after people have outgrown those children's games keep playing an essential part in their life. These games become more complicated and extensive. During games, players play roles, try to accomplish goals, have to carry out activities and experience restrictions (Caluwé et al., 1996).

De Caluwé, Geurts, Buis & Stoppelenberg (1996) quote Huizinga (a Dutch philosopher) to describe the concept 'game'. Huizinga once stated that a game consists out of the following elements (Caluwé et al., 1996):

- A casual activity
- Executed within boundaries of time and space
- Played according to freely chosen, but after that, mandatory rules
- The goal is the activity
- The activity is guided by a feeling of excitement and joy and the awareness that the activity is different than the real life

Especially the last element states that people, when playing a game, enter a world that is different from the real world. A world in which one can experiment and make mistakes without affecting the real world. This is why games are considered a safe way to learn. Most games are played for pleasure, but often the real goal of a game is to playfully teach people certain lessons they can use in their real life. Some games are mainly designed to create this learning environment, others are more developed for pleasure purposes. The game as a consciously created learning environment is the point of focus in this research. In such games, the actual goal of the game, in fact, lies outside the game. The purpose of the designers of this kind of games is to teach the players something with the help of the course of the game itself (Caluwé et al., 1996).

2.2.2 Simulation

The word simulation means 'to mimic'. Simulations can be used to simplify a complex system in order to better understand this system. This simplification thus mimics the complex system from the real world and is called a model. A simulation, in fact, is carrying out experiments with this model, so that dynamics in the system can be analysed. In short, a simulation encompasses experiments with a dynamic model that consists out of essential characteristics of a system from the real world (Caluwé et al., 1996).

2.2.3 Simulation games

In the concept 'simulation gaming' the concepts 'game' and 'simulation' come together. From the preceding paragraphs the definitions of these last two concepts can be derived:

Games are casual activities in which players play roles, try to accomplish goals, have to carry out activities and experience restrictions within a set of rules, during which they can safely learn and experiment with actions and skills they can use in the real world

Simulations are experiments with a dynamic model that consists out of essential characteristics of a system from the real world

When these definitions are combined, simulation gaming can be defined as an activity in which players play roles, try to accomplish goals, have to carry out activities and experience restrictions within the rules of a dynamic model, that consists out of essential characteristics of a system from the real world and during which they can safely learn and experiment with actions and skills they can use in this real world

In this definition, some aspects of simulation gaming come forward. Firstly, during a simulation game-players move within a model. This means that whatever the goal of the simulation game is, it will help to identify the complexity of a system and teach players how to deal with this.

Secondly, this is a model of the real world. Artificial conditions are created that look like situations from the real world. As it were, a sort of micro-cosmos is built in which organizational processes arise at a fast pace and on a small scale that can be related to situations in the real world.

Thirdly, this 'real-world' model is dynamic, which means that under the influence of actions and behaviour of the players, the simulation game keeps changing. This makes it possible for the players to immediately see what the consequences of their actions would be in the real world and to try out other techniques, strategies or attitudes. In fact, the game allows the players to look into their self-created future and act on this.

Fourthly, the dynamic 'real-world' model gives room to learn and experiment safely. It makes that people can act freely, without any chance of affecting the real world

The working of simulation games was explained above. This information can be used to establish the contributions that a simulation game can make to a behavioural change (Caluwé et al., 1996, pp. 21-22).

2.3 Simulation games and changing behaviour

In this paragraph, the abovementioned information is combined and more literature is gathered to establish in what way a simulation game can contribute to a behavioural change. First, the functions that simulation games can have in change processes are described. In the second part of this paragraph, the connection is made between the literature on behavioural change and these functions. The way in which simulation games can help in inducing behavioural change is established.

2.3.1 Simulation games in change processes

As it became clear from the definition of simulation gaming that was mentioned above, a simulation game is used to let participants playfully learn skills and obtain insights about consequences of certain behaviour. The simulation game provides a model of the real world, which creates a safe environment and makes it possible to experiment with ideas or structures and learn what consequences are connected to them (Caluwé et al., 1996, p. 21). The suitability of applying a simulation game to induce a behavioural change process is related to the similarity between learning and change processes.

A change process is not very different from a learning process, as learning processes are often initiated to change individuals, groups or organizations in any respect whatsoever (adding knowledge, learning skills, experimenting with new behaviour etc.). This means that simulation games, which are used to initiate learning processes, can also be used to start change processes (Caluwé et al., 1996, p. 70).

Within a behavioural change process, a simulation game can contribute to learning on several aspects. One game could contribute to learning on multiple of those aspects at the same time. However, one should always establish the purpose of the simulation game very well and should think through if a specific simulation game would be suited for that (Caluwé et al., 1996):

- **Creating awareness and motivation**
  The simulation game can make people aware of the existence and size of a certain problem. This leads to motivation to go to work with this problem.
- **Adding knowledge and insights**
  A simulation game can give people insight into the effects of decisions. The advantage of using a simulation game is that it can also provide insight into the impact of the decision on the long-term because a time span of multiple years can be simulated.

- **Training skills**
  While playing a simulation game, people can learn new skills. They can practise this new behaviour, experience the consequences and effects of this behaviour and can adjust it again.
- **Learning on communication and teamwork**
  Particular skills that people can practice during a simulation game and for which a lot of specific simulation games were developed are communication and teamwork.
  During these games, team formation could be promoted, or patterns of teamwork could be held against the light, so improvements can be made to them.
- **Integrating learning experiences**
  Simulation games can also be applied at the end of a training course for people to be able to combine all the learned knowledge in one practical exercise.

Next to this, a simulation game could work very well on one group of people and not at all on another group. This has to do with a lot of factors, for instance, group-composition, types of persons, person's backgrounds, etc. Some games can better be used across groups than others. On this scale three types of games can be distinguished (Caluwé et al., 1996):

- **Off-the-shelf-games**
  These are games that are immediately ready for use. This means different groups, of different people, can use this simulation game for the purpose it was designed for. These games have a pre-fixed model and procedure and a clear description of how to play the game.
- **Frame-games**
  For these games, a part of the content can be specifically tailored to the group or organization that is going to play the game. The procedure and part of the material are pre-fixed. Frame-games can thus be 'loaded' with information that is relevant to the group or organization concerned.
- **Tailor-made-games**
  These games have a procedure and content that are specifically tailored to the group or organization for which they are designed. This happens when the specific goals and purposes of the simulation are really specific and cannot be provided by one of the abovementioned game types. These games are based on models that are available from the literature, but these are tailored to the specific group or organization.

Applicability across groups of the different types of games diminishes from top to bottom in the abovementioned list. Every group could yield different results from the same simulation game, even from off-the-shelf-games. However, the differences between the group results would be the smallest with off-the-shelf-games.

2.3.2 Cognitive aspects of simulation gaming

Eventually, the abovementioned types and functions of games all have the purpose to teach participants something. There are different ways in which a game can teach participants skills or give them insights. Caluwé (2008) states in his contribution to the book 'Why do games work?' that games use the window and mirror effect for this. The window effect arises when the game shows the participants other ways to do or explain things. With this new knowledge, people could change their attitudes towards this behaviour and eventually their behaviour itself. An example of a 'window-game' is a game in which participants are assigned roles and tasks that they are not used to have or do in real life. The mirror effect arises when people can look at themselves, how they act, do, think and react in real life.

Based on what they experience they could choose to change their attitude and eventually their behaviour. An example of a 'mirror-game' is a game in which participants are asked to act like they usually do, but the game is set up in such a way that this will cause problems during the game-play.

Of course, a simulation game could serve both objectives. It could mirror participant's actions, and if they do not know how to improve them, the game could provide a window in which some new options to handle things are presented. However, often one of the two objectives is more prominent than the other.

By experiencing the pros and cons of the old or the new behaviour, people could change their attitude towards this behaviour and eventually also the behaviour itself. The mirror and window effect, therefore, both match the cognitive way of looking at behavioural change in which attitude and beliefs are altered so behavioural change can follow. In this explanation the mirror effect mostly resembles the method of persuasion to change attitudes and beliefs, whereas the window effect mostly resembles the dissonance method. The influence of simulation gaming on behavioural change is schematically represented in Figure 7 (Caluwé et al., 2008).
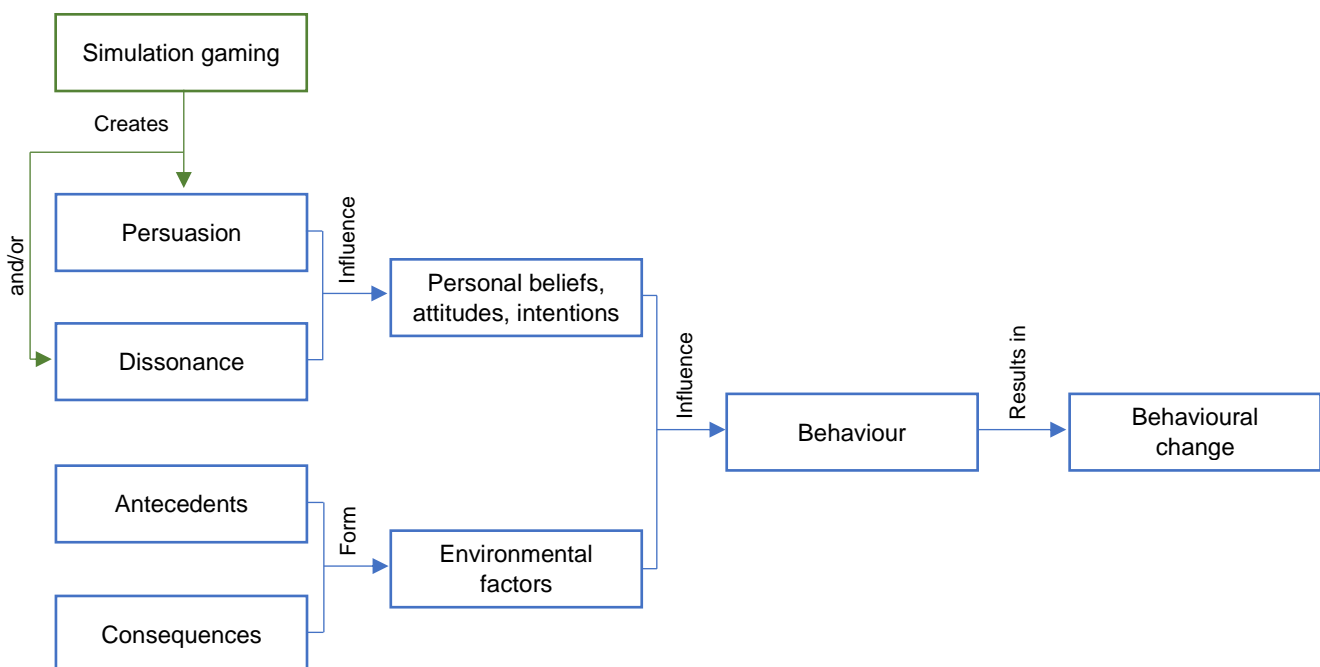
Figure 7. Schematic representation of influence of simulation game on behavioural change

2.3.3 Cognitive aspects of Game X

Like other simulation games, also Game X influences attitude to create behavioural change. When the description of the game in paragraph 1.2.2 is compared to the abovementioned theory, it becomes clear that the game uses both the window and mirror effect.

In Game X the new project structure and the gate reviews that were explained in the preceding presentations have to be applied by the participants. With the help of the window effect during the first day, the participants bit by bit get more information on how to apply this structure and these gate reviews. During the game, they have the opportunity to bring this new knowledge into practice. In this way, learning experiences are integrated in the game and skills are trained.

With the help of the mirror effect, the participants learn the consequences of their behaviour and could start to see that they have to change their actions to improve teamwork on the projects. The game thus creates insights for the employees of Organization Z about the consequences of their actions and teaches them about teamwork and communication. Eventually, the game should increase the awareness amongst the employees that the current behaviour on the projects causes problems for successful teamwork.

The ultimate goal of Intervention Y is a behavioural change on the side of the employees. Game X contributes to this goal by teaching about a new structure that should support this behavioural change and by increasing awareness amongst employees that a behavioural change is needed and how this can be achieved.

Game X was tailor-made for Organization Z. This means that application of this game to another company could yield very different results. The results from this research into the effects of Game X on the behaviour of the employees of Organization Z are therefore not representative for the application of this game to other construction companies. To really establish what effects a simulation game could have on a construction company, more research has to be done. This is elaborated in Chapter 10.

2.3.4 Assessment criteria

From the schematic representation in Figure 7 can be derived that a simulation game influences behavioural change through the adjustment of personal beliefs. Also, Game X was found to aim at adjusting personal beliefs of employees. One could say that the simulation game is effective if it creates enough persuasion or dissonance for personal beliefs to change in such a way that behavioural change follows. Therefore, both the changes in expressed behaviour and attitude of the people towards their behaviour are assessment criteria. With the help of these criteria, the effectiveness of a simulation game can be established.

2.4 Application to Game X

In this empirical research the effectiveness of Game X is determined. In the previous paragraph was established that both the change in attitude and the change in behaviour towards the intended attitude and behaviour are assessment criteria that should be used to establish this effectiveness. To determine the effectiveness of Game X, therefore, first the intended change in attitude and behaviour that is pursued with this simulation game has to be determined. When this is known, the extent to which these changes are achieved could be measured and this could tell something about the effectiveness of the game. In the following section, the change in behaviour that is intended with the application of Game X will be discussed. After this, the change in attitude that is needed to set in this behavioural change will be explained.

2.4.1 Intended behavioural change

As was also learned from Chapter 1, with Intervention Y and thus with the application of Game X, Company X pursues a behavioural change amongst project team members on the projects of Organization Z, towards behaviour that better supports successful teamwork.

To be able to assess the effectiveness of Game X, it is necessary to know what behaviour supports successful teamwork. According to Bakker and De Kleijn (2014) evidence shows that a project team is most successful if 'the project manager is able to build together with his contractors and subcontractors a fully integrated team'.

But what is an integrated team? According to the Cambridge Dictionary, the meaning of the word integral is: 'necessary and important as a part of a whole' (Cambridge, 2013). This same dictionary defines teamwork as: 'the ability of a group of people to work well together'.

When these definitions are combined, integral teamwork can be defined as 'the ability of a group of people to work well together, in which everything and everyone is necessary and important as a part of a whole'. This means that in an integrated team all aspects and all actions influence each other as they are all important to create the 'whole'.

This characteristic of integral teamwork is used by Vroemen (2001) as he states that successful teams are teams in which, amongst others, self-governance, task integration and joined responsibility are essential features. So, working together integrally comes very close to having a big chance at being a successful team.

There are a lot of different sources that state the content of integral teamwork. See for example BouwnD (2015), Knuiman (2007), Pikkaart (2015), Vugt (2017), Bakker & Kleijn (2014), Vrancken & Thiel-Wortmann (2016). When the information from these sources is put together, five themes stand out. Themes that come back in every article as being part of an integral way of working together are:

- Considerate and helpful
- Communicating
- Learning
- Equality
- Clarity of process and goals

The combination of these themes is most accurately laid down by Vroemen (2001) in his six success factors for teams. In the following enumeration these factors will be mentioned and the contents of these factors will be explained. To illustrate what behaviour is connected to successful teamwork, Vroemen (2001) defines behaviours that support the achievement of the success factors and behaviours that much more prevent this. These behaviours will be stated per success factor. A more elaborate explanation of the factors can be found in Appendix A.

- **Clear goals**
  In a successful team workable goals are set, which are clearly formulated, realistic, measurable and meaningful. All team members support these goals and they all act in the best interest of these goals. Progress in achieving these goals is monitored. Behaviours that support the achievement of this factor and behaviours that obstruct this are shown in Table 1 on the next page.

Table 1. Supporting and obstructing behaviour within the success factor 'clear goals'

Support successful teamwork	Obstruct successful teamwork
First think, then act	Starting something without thinking
Using a clear approach	Setting unclear goals
Evaluate, test	Giving no feedback
Stimulate to get better	Use hidden agendas

- **Joint responsibility**
  In a successful team every team member has a say in the decision making as well as about the end result, which implies that everyone is judged on the end result. Hiding behind others or blame others is then not possible anymore. In a successful team it is not possible to win individually, the team wins. Behaviours that support the achievement of this factor and behaviours that obstruct this are shown in Table 2.

Table 2. Supporting and obstructing behaviour within success factor 'joint responsibility'

Support successful teamwork	Obstruct successful teamwork
Taking over tasks from someone else	Let the other person mess up
Wanting to do something for another	Drop others
Support each other	Being disinterested
Worry about the result	Blame someone else

- **Open communication**

   In a successful team the team members communicate effectively with each other, which means that information is selected and distributed to the right persons. Next to this, team members really pay attention and are open to the ideas of other team members. Lastly, team members are clear about expectations, uncertainties, wishes and ideas and communicate honestly with each other. Behaviours that support the achievement of this factor and behaviours that obstruct this are shown in Table 3.

Table 3. Supporting and obstructing behaviours within the success factor 'open communication'

Support successful teamwork	Obstruct successful teamwork
Fully inform each other	Withholding information
Giving feedback	Not discussing problems
Giving your opinion	Being unclear and vague
Being honest	Gossip about other team members

- **Mutual respect**

   In a successful team, team members are considered equal. This means that every team member feels appreciated, involved and listened to. Next to this they have empathy for each other's strengths and weaknesses, opinions and perceptions. Behaviours that support the achievement of this factor and behaviours that obstruct this are shown in Table 4.

Table 4. Supporting and obstructing behaviours within the success factor 'mutual respect'

Support successful teamwork	Obstruct successful teamwork
Listening to each other	Not listening to each other
Involve the others	Point out patsies
Being tolerant	Not taking others seriously
Express appreciation	Impose your own opinion

- **Flexible adjustment**

   In a successful team the team members learn from each other and from former experiences. Learning from former experiences can be done through evaluation. The team keeps developing, is willing to try new things and does not stay stuck in certain methods or approaches. This makes that the team is able to adjust itself to the circumstances at any time. Behaviours that support the achievement of this factor and behaviours that obstruct this are shown in Table 5.

Table 5. Supporting and obstructing behaviours within the success factor 'flexible adjustment'

Support successful teamwork	Obstruct successful teamwork
Learn from mistakes, evaluating	Making mistakes over and over again
Trying something new	Ridicule new things
Being curious	Always defending the old
Seeing the value of every idea	Only looking back

- **Showing initiative**

  In a successful team, the team members do what they say, have an active instead of passive attitude and try to solve problems directly themselves. In the team it is supported to express ideas and to undertake actions. Behaviours that support the achievement of this factor and behaviours that obstruct this are shown in Table 6.

Table 6. Supporting and obstructing behaviours within the success factor 'showing initiative'

Support successful teamwork	Obstruct successful teamwork
Looking forward	Waiting
Expressing ideas	Discourage others
Doing proposals	Focussing on barriers
Responsibly taking risks	Act recklessly

The goal of the program Intervention Y, to which Game X contributes, is to initiate a behavioural change on the side of the employees of Organization Z towards behaviour that better supports successful teamwork. From paragraph 2.3.4 it became clear that one criterium that should be measured to determine the effectiveness of a simulation game in such a behavioural change process is the intended behavioural change. The behavioural change that is intended with this program and this game is a shift from behaviour that obstructs successful teamwork towards behaviour that supports this. To establish the effectiveness of Game X, first, the degree to which the 'obstructing' and 'supporting' behaviours that were mentioned above are shown on the projects before the game is played has to be determined. Subsequently it has to be established if more 'supporting' and less 'obstructing' behaviour is shown after the game is played. The differences between this before and after situation show if the intended change in behaviour occurred.

2.4.2 Intended attitude

Paragraph 2.3.4 stated that another criterion that should be measured to establish the effectiveness of a simulation game in a behavioural change process, is the attitude of the participants towards their own behaviour. If the awareness amongst participants about the dysfunctionality of their behaviour increases, and if participants adopt a more negative attitude towards certain behaviours that they show on the projects, the willingness to change these behaviours also increases. This thus boosts the chance of a behavioural change.

As was learned from paragraph 2.3.3 'the ultimate goal of Intervention Y is a behavioural change on the side of the employees. Game X contributes to this goal by teaching about a new structure that should support this behavioural change and by increasing awareness amongst employees that a behavioural change is needed and how this can be achieved'. Another way to determine the effectiveness of Game X, thus, is to first establish, before the game is played, if participants are aware of the need for a behavioural change and if they know what they can do to initiate this. Subsequently it should be established if this awareness has increased after the game is played. The differences between this before and after situation show if the intended change in attitude occurred.

2.4.3 Defining sub-questions

With the help of the information from this chapter, it is possible to define the content of this research into more detail. This can be done by defining sub-questions that can help to find an answer to the research question. The research question that was stated in Chapter 1 was:

'Is a simulation game like Game X an effective tool to induce a behavioural change amongst employees of a construction company?'

According to the information in this chapter, to establish the effectiveness of Game X, first, the degree to which the 'obstructing' and 'supporting' behaviours that were mentioned above are shown on the projects before the game is played has to be determined. Subsequently it has to be established if more 'supporting' and less 'obstructing' behaviour is shown after the game is played. Another way to determine the effectiveness of a simulation game like Game X, appeared to be to first establish, before the game is played, if the participants are aware of the need for a behavioural change and know how to initiate it. Subsequently it should be established if this awareness has increased after the game is played. When these before and after situations are compared, changes in behaviour and attitude could be noticed. When these changes are positive, this does not immediately imply that the simulation game is effective. For that, first should be investigated if these changes really could have been caused by a simulation game like Game X. It should be established if these changes can be explained by what happens during the simulation games.

This empirical research tries to answer the research question by investigating the effectiveness of Game X itself. For this empirical research, the abovementioned research methodology that follows from the literature study can be summarized in several sub-questions:

- To what extent are behaviours shown that support successful teamwork and to what extent are behaviours shown that obstruct successful teamwork before Game X is played?
- Are participants before the game is played aware of the need for a behavioural change and do they know how to initiate it?
- Are less behaviours shown that support successful teamwork and are more behaviours shown that obstruct successful teamwork after Game X is played?
- Are participants more aware of the need for a behavioural change and of what they can do to initiate it after they played the game?
- Can the differences between the before and the after situation be explained by what happens during the simulation game?

2.5 Conclusion

This chapter started with an explanation of different mechanisms for behavioural change. Different theories about what influences behaviour and causes behavioural change were discussed. Also, information was provided on what a simulation game does entail and in what way it can contribute to behavioural change. With the help of this information, two criteria were determined which can help to establish the effectiveness of a simulation game. The content of these criteria was specified into more detail for the investigation of the effectiveness of the specific Game X. Based on this information the content of this empirical research was summarized in sub-questions.

Simulation gaming contributes to the cognitive way of changing behaviour. With the help of mirror and window effects simulation games create persuasion or dissonance, which are mechanisms that influence personal attitudes.

A change in personal attitudes could lead to a change in behaviour. By measuring the extent to which attitude and behaviour changed towards the intended attitude and behaviour after the game was played, the effectiveness of this game can be established.

In this empirical research Game X is investigated. The behavioural change that is intended with this game is a shift from behaviour that obstructs successful teamwork towards behaviour that supports this. 'Obstructing' and 'supporting' behaviours were mentioned. The change in attitude that is intended is an increase in awareness amongst employees of the need for a behavioural change and the actions that can be undertaken to initiate this behavioural change.

When the changes that occurred in attitude and behaviour can be explained by what happens during the game, the effectiveness of Game X can be determined.

To summarize this research methodology for this empirical research, the following sub-questions were determined. The answers to these sub-questions should help to answer the main research question of this empirical research:

- To what extent are behaviours shown that support successful teamwork and to what extent are behaviours shown that obstruct successful teamwork before Game X is played?
- Are participants before the game is played aware of the need for a behavioural change and do they know how to initiate it?
- Are less behaviours shown that obstruct successful teamwork and are more behaviours shown that support successful teamwork after Game X is played?
- Are participants more aware of the need for a behavioural change and of what they can do to initiate it after they played the game?
- Can the differences between the before and the after situation be caused by what happens during the simulation game?

Part II

Technical design

In this part, first the technical research design that would best fit this research according to theory is determined. After this, the limitations that were posted on the application of this technical research design by the context in which the research had to be conducted are described. These limitations make some modifications to the technical research necessary. This part ends with a conclusion in which the technical research design that is applied in this research is stated.

Chapter 3 Theoretically best technical design

In this chapter, the technical research design that according to theoretical knowledge could best be used to answer the research question of this research is determined. A technical design describes how, where and when this goal will be achieved. For this, in the first paragraph of this chapter the research approach that would best fit this research is determined. The research approach says something about the type of data that is gathered in the research. In the second paragraph the methods for data gathering that could best be used to obtain the required data for this research are defined. The chapter ends with a conclusion in which the technical research design that would theoretically best fit this research project is schematically shown.

3.1 Research approach

Research projects often can be divided into two broad categories of research approaches: a quantitative and a qualitative approach. According to Creswell and Clark (2011), a third research approach is formed by the mixed-methods approach in which a mix of quantitative and qualitative methods of data collection is provided. In this paragraph the research approach that best fits the empirical research into the effectiveness of Game X is determined. First, the application of quantitative and qualitative ways of data collection is discussed. In the next paragraph the application of the mixed-methods approach to this research is investigated.

3.1.1 Quantitative and qualitative approach

To answer the research question the existence and the nature of the relation between Game X and a possible behavioural change has to be measured.

According to Hennink et al. (2011) and Leedy and Ormrod (2001) quantitative research focusses on establishing, confirming or validating whether or not a relationship exists between two variables. It does this by using a large sample size and determining the existence of a relation between the two variables within this sample size. When the individuals within the sample size are randomly picked and the sample size is large enough, it can be assumed that the findings from the quantitative study are representative for the broader population of which the sample was taken. In this way, the existence of the relationship can be established. More information about characteristics of quantitative research can be found in Appendix B.

The research question can be answered by answering the sub-questions that were defined in the conceptual design. The first four sub-questions together define the existence of a relation between the simulation game and a behavioural change. Quantitative data collection is therefore suited to answer these first four sub-questions:

- To what extent are behaviours shown that support successful teamwork and to what extent are behaviours shown that obstruct successful teamwork before Game X is played?
- Are participants aware of the need for a behavioural change before the game is played and do they know how to initiate it?
- Are less behaviours shown that obstruct successful teamwork and are more behaviours shown that support successful teamwork after Game X is played?
- Are participants more aware of the need for a behavioural change and of what they can do to initiate it after they played the game?

Creswell and Clark (2011) determine quantitative research as incapable of establishing causal relationships. This approach therefore is not suited to determine the answer to the fifth sub-question that tries to establish the nature of the existing relation:

- Can the differences between the before and the after situation be caused by what happens during the simulation game?

According to Hennink et al. (2011) a research approach that is able to establish causal relationships is a qualitative approach. More information about qualitative data can be found in Appendix B. Qualitative data collection should be used during the game to establish whether or not the developments in behaviour and attitude could be caused by the developments during the game. This answers the fifth sub-question. With the help of the answers to the five sub-questions the research question can be answered.

3.1.2 Mixed-methods approach

To answer the research question a mix of quantitative and qualitative ways of data collection is thus needed, which means that a mixed-methods approach could be applied. The way in which the quantitative and qualitative approaches are connected to each other in a mixed-methods research is defined by the research design. Creswell and Clark (2011) state two ways in which such a research design for a mixed-methods research could be determined: a dynamic approach and a typology-based approach. According to them, the dynamic approach fits better for researchers that already have a lot of expertise in mixing methods. As the researcher of this research is inexperienced with mixing methods, the dynamic approach does not fit in determining the research design for this research.

This means that the typology-based approach should be used to determine the way in which the quantitative and qualitative data collection in this empirical research are connected to each other. In the typology-based approach a research design is chosen from a list of predefined ways in which quantitative and qualitative data collection can be connected to each other, and this design is adapted to the particular research's purpose. A list of the four major mixed-methods research designs is given by Creswell & Clark (2011):

- Convergent parallel design
- Explanatory sequential design
- Exploratory sequential design
- Embedded design

In Appendix C these mixed-methods research designs are explained in text and schematic representations. As was established, to answer the research question quantitative data collection has to be used to determine the existing behaviours and attitudes before and after the game is played and qualitative data collection during the game has to be used to determine if the developments in behaviour and attitude can be caused by developments during the game. Timewise, the qualitative data collection thus has to be conducted before the quantitative data collection is finished. Therefore, the qualitative data collection has to be conducted within the quantitative research before and after the game.

According to Creswell & Clark (2011) the mixed-method research design that can best be used to collect qualitative data within a quantitative research, is the embedded research design. In an embedded research a qualitative data gathering method is used within a quantitative research or vice versa, to enrich the results. In Appendix C this mixed-method research design is explained. Figure 8 on the next page shows a schematic representation of the application of the embedded research design to the empirical research conducted in this research.
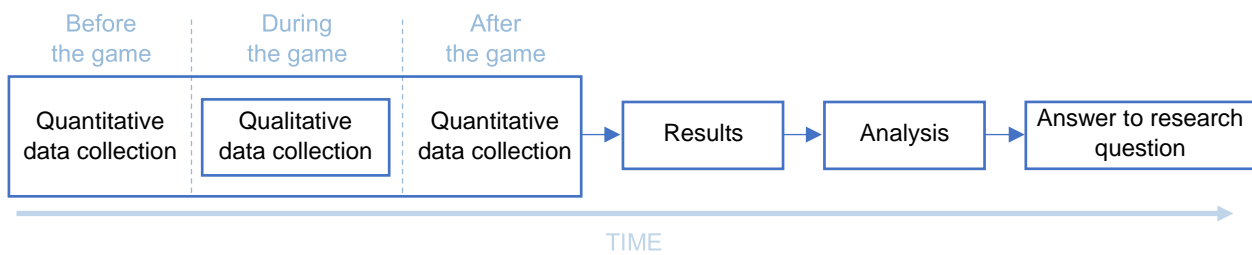
Figure 8. Research design to answer the research question

3.2 Methods for data gathering

The quantitative and qualitative data that has to be gathered according to the technical research design that was shown in Figure 8, has to be collected with the help of certain data gathering methods. In this paragraph, the methods that are best suited for gathering the required quantitative and qualitative data for this empirical research are determined.

As was established in Chapter 2, in this research, the behaviour of project team members in project teams of Organization Z has to be measured. According to Sommer and Sommer in their book 'A practical guide to behavioural research', the methods for data gathering that are mostly used to measure behaviour are (Sommer & Sommer, 2002):

- Questionnaires
- Interviews
- Observations

Characteristics of these data gathering methods are explained in Appendix D, Appendix E and Appendix F. Sommer & Sommer (2002) state that the most reliable information is gathered when different methods for data gathering are used, this is called the triangulation of methods. Therefore, in this research a combination of different research methods is used. In the following sections, the most suitable methods for quantitative and qualitative data collection are discussed.

3.2.1 Before the game: quantitative data collection

To create a clear overview, in Figure 9 the quantitative data collection for which suited data gathering methods are defined in this section is coloured green.

Figure 9. Overview of data collection that is considered in this 3.2.1

This quantitative data should determine the existing behaviours and attitudes on the projects before the game was played and should thus answer the first two sub-questions that were determined in the conceptual design. In the following text the data gathering methods that would ideally be applied to gather quantitative data to answer respectively the first and the second sub-question are determined.

In this sub-question, the existing behaviour on the project teams before the game is applied needs to be measured. Ideally, the behaviour within multiple project teams that are scheduled to play the game is measured before anyone in the company played the game. In this way there is no prior knowledge of what will come, which prevents biased answers. Within the project teams, the degree to which the behaviours are shown that support or obstruct successful teamwork has to be measured. According to Hennink et al. (2011) the best way to measure natural behaviour is via an observation.

According to the previous paragraph, the data from these observations has to be quantitative. As was already explained, quantitative data collection is characterised by the large sample size that is used. This means that for this quantitative data collection, as much different project teams that will play the game as possible have to be observed.

According to Hennink et al. (2011) the added value of an observation is the opportunity to observe people in their own socio-cultural context. To find the most truthful answer to this sub-question different project team members should thus be observed during different activities of their day to day work (site visits, official meetings, casual meetings, etc.). It is assumed that most activities can be observed, if the team members are observed for at least one month.

Sommer & Sommer (2002) determine a range of different approaches to do an observation. The one end of this range is formed by the participant observation and the other end by the non-participant observation, which corresponds with the researcher completely participating in a culture, respectively with the researcher as invisible as possible. According to Sommer & Sommer (2002), when behaviour of other people has to be examined, like in this research, the non-participant observation could best be used. However, the presence of a non-participant observer could influence the behaviour that is observed. This makes it important for the researcher to keep in mind what his or her presence will do to the activities that are observed.

Hennink et al. (2011) distinguish a casual and a systematic observation. In a casual observation the observer observes the behaviour and makes notes when things seem interesting. For a systematic observation, a checklist of certain behaviours that have to be observed is made in advance. In this research, a systematic observation can best be conducted for which the checklist should exist out of the 'obstructing' and 'supporting' behaviours that were determined in paragraph 2.4.1.

Sub-question 2: Are participants aware of the need for a behavioural change before the game is played and do they know how to initiate it?

Paragraph 2.4 makes clear that, besides behaviour, also the attitude of participants towards their behaviour has to be measured. The purpose of the simulation game is to make people aware of the need for a behavioural change and to teach them how they could initiate this themselves. To see the influence the simulation game can have on these attitudinal aspects, these have to be measured before and after the game is played. However, as is stated by Sommer & Sommer (2002) it is not possible to measure attitude via observation, so another data gathering method should be used. Triangulation of methods makes that the reliability of this research increases by using an additional method for data gathering.

Hennink et al. (2011) state that for measuring attitude a questionnaire or an interview could best be used. According to Figure 9 the data that has to be collected via this questionnaire or interview has to be quantitative. Hennink et al. state that for collecting quantitative data a questionnaire could best be used. According to them, it is easier and less time-consuming to have a large group of individuals to respond to a questionnaire instead of to an interview. The questionnaire should involve mostly questions about participant's attitudes towards behavioural change, but when this questionnaire also includes questions about the presence of behaviour and the answers to these questions resemble the results from the observations, both data gathering methods strengthen each other. This makes the results more reliable.

To have the largest possible sample size, the questionnaire should be sent to all employees that are scheduled to play the game. Hennink et al. (2011) and Leedy and Ormrod (2001) determine issues to keep in mind when designing the questionnaire. For instance, the more general questions should come first, which mostly are the questions about attitude.

They should be followed by the questions that focus more on a certain behaviour. Because the sample size of this questionnaire will be quite large, a simple and quick analysing process for this questionnaire is preferred. Therefore, for all questions, the itemised rating scale with five answer options (totally agree, agree, no strong opinion, not agree, totally not agree) will be used. According to Hennink et al. (Hennink et al.) it is important to pay attention to the wording of the 'neutral ' option when formulating these answer-possibilities. This because this option is often used as a 'don't know' option.

The conclusion from this section is shown in Figure 10.
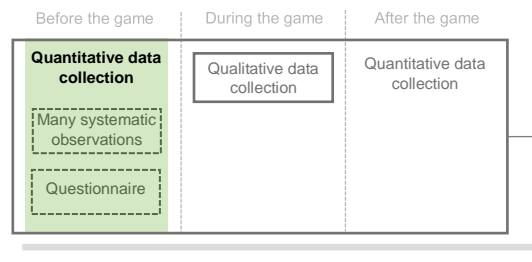
Figure 10. Quantitative research before the game: observations and questionnaire

3.2.2 During the game: qualitative data collection

To create a clear overview, in Figure 11 the qualitative data collection for which suited data gathering methods are defined in this section is coloured green.

Figure 11. Data collection that is considered in section 3.2.2

This qualitative data should determine what happens during the simulation game and should thus answer the fifth sub-question that was determined in the conceptual design. In the following text the data gathering method that would ideally be applied to gather qualitative data with which this sub-question could be answered is stated.

Sub-question 5: Can the differences between the before and the after situation be caused by what happens during the simulation game?

When this has to be established, it is necessary for the researcher to know what happens during the game. Only when this is clear, developments in behaviour and attitude on the projects could be linked to developments in behaviour that were noted during the game. To see what happens with the behaviour of participants during the game it would be best to use observation, as this is the best method to measure natural behaviour. As a game could yield different results for different game groups, project teams that are observed on their day to day should also be observed during the game. In this way, the witnessed developments in real life can be connected to the developments during the game.

As can be seen in Figure 11 these observations should collect qualitative data. It was established that qualitative data is characterised by a smaller sample size. This means that it is not necessary to observe all project teams during the game that were also observed before the game. However, the more teams that are observed, the more reliable the results, as the game could yield different results for every game group.

This data should provide answers to the question why participants would change their behaviour in response to the simulation game they played. However, these observations during the game will take place before the measurements of behaviour after the game are done. This means that it is not clear yet which behaviours will change and which do not, so during the observation of the game it is not clear for which behavioural change connections should be found in the game-play. This makes a casual observation in this case more suitable, as in this type of observation no predefined checklist of observed behaviours is needed. In a casual observation behaviour is observed and interesting situations are noted. In this research, interesting situations are formed by moments during which participants could learn something about the consequences of their behaviour and become aware of the need for a behavioural change.

To give a little guidance to the observations the findings from the quantitative data collection on existence of behaviour and attitude before the game is played could be kept in mind. From this data it becomes clear which obstructing behaviours were shown most often on the projects before the game was played. It would be preferable when, due to the simulation game, a behavioural change on these most common obstructing behaviours arises. This makes the situations in which the participants develop on these behaviours most interesting to note down during the observations.

The conclusion from this section is shown in Figure 12.
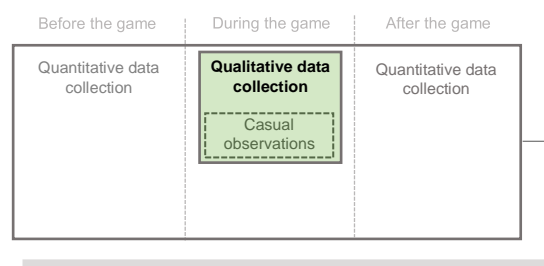
Figure 12. Qualitative research during the game: observations

3.2.3 After the game: quantitative data collection

To create a clear overview, in Figure 13 the quantitative data collection for which suited data gathering methods are defined in this section is coloured green.
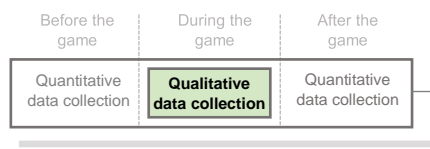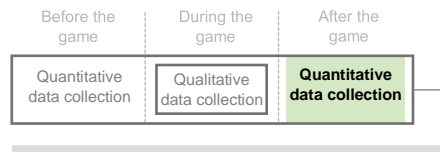

Figure 13. Data collection that is considered in section 3.2.3

This quantitative data should determine the existing behaviours and attitudes on the projects after the game was played and should thus answer the third and fourth sub-question which were determined in the conceptual design. In the following text the data gathering methods that would ideally be applied to gather quantitative data to answer respectively the third and the fourth sub-question are determined.

Sub-question 3: Are less behaviours shown that obstruct successful teamwork and are more behaviours shown that support successful teamwork after Game X is played?

To see if there is a difference in the expressed behaviour before and after the game, the same project teams that were observed before the game was played have to be observed in the same way after the game is played. Different members of the project teams should be observed on their day to day work during different activities. Behaviours that support or obstruct successful teamwork could again be noticed with the help of a checklist. The observations again should produce quantitative data, which means that the same big amount of project teams has to be observed after the game as was observed before the game was played. According to Sommer & Sommer (2002) changing behaviour often takes a long time, so the observations should be continued as long as possible.

Sub-question 4: Are participants more aware of the need for a behavioural change and of what they can do to initiate it after they played the game?

To measure the difference in attitude before and after the game was played, participants' attitudes before and after the game have to be compared. According to Hennink et al. (2011) questionnaires have the advantage that results can easily be compared, provided that the exact same questionnaire is distributed after the game is played. One question that is posed differently could influence the way respondents answer the questions. When the exact same questionnaire is distributed, the difference in participants' attitudes can be measured best. The questionnaire should be distributed to the same sample as the prior questionnaire. To be able to establish the real new attitude it is best to distribute the questionnaires a couple of months after the game was played. In this way, the new attitude has had enough time to develop.

In Figure 14 the conclusion of this section is shown.
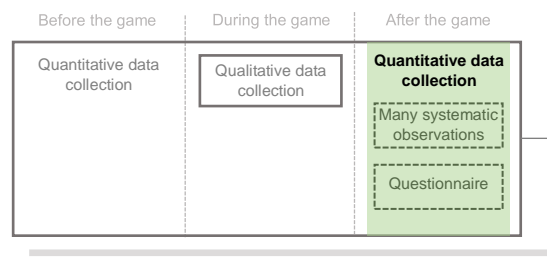
Figure 14. Quantitative data collection after the game: observations and questionnaires

3.3 Conclusion

In this chapter the technical research design that theoretically would best fit the empirical research into the effectiveness of Game X was determined. In the first paragraph the ideal combination of quantitative and qualitative data collection was laid down in a technical research design. In the second paragraph the different methods for data gathering that could best be used within this technical research design to gather the quantitative and qualitative data were added to this design. This technical research design helps to determine how, where and when the sub-questions should be answered, which eventually helps to determine an answer to the research question of this research.

According to this theoretically best technical design, the first two sub-questions could best be answered quantitatively with the help of many systematic observations of the behaviours within project-teams. Also, a questionnaire that determines the attitudes of all members of these observed project-teams towards the expressed behaviour should be used. The data should be gathered before the game is played.

The theoretically best technical design determines that the fifth sub-question could best be answered qualitatively, with the help of some casual observations during different game-plays in which project teams that were also observed before the game take part. The data should be gathered while the game is played.

Lastly, according to the theoretically best technical design, the third and fourth sub-question could best be answered quantitatively with the help of systematic observations of the same project teams that were observed before the game was played. Furthermore, the questionnaire that was distributed before the game was played should be used to gather information about the attitudes of the members of the observed project-teams towards their own behaviour. This data should be gathered after the game is played.

The use of multiple different methods for data gathering makes the results of this research more reliable, because of the triangulation of methods. A schematic representation of the theoretically best technical design that was determined in this chapter, including the methods for data gathering that best could be used, is shown in Figure 15.
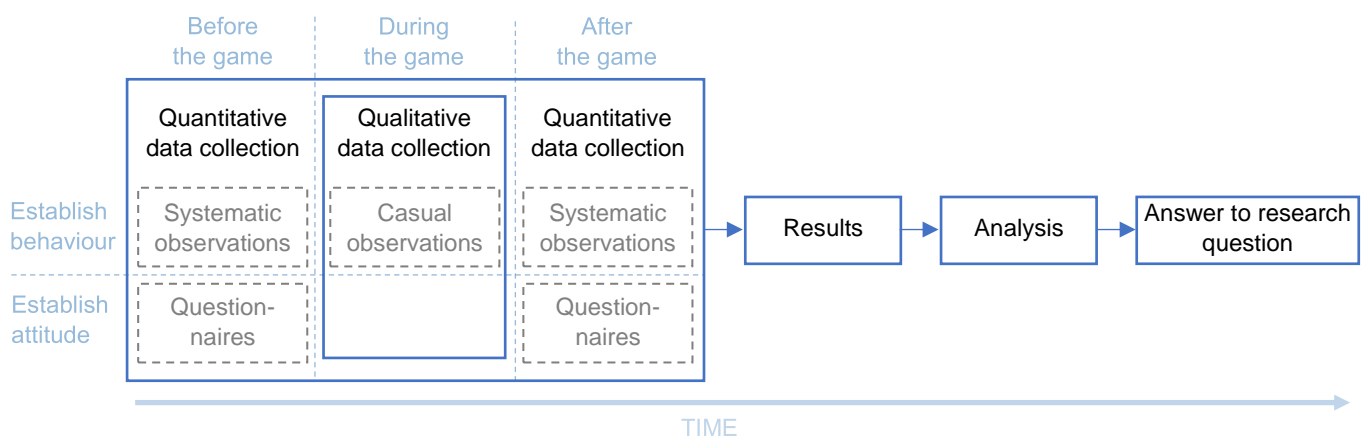
Figure 15. Schematic representation of theoretically best technical research design with methods for data gathering

Chapter 4 Practical difficulties and solutions

Some practical difficulties arose when carrying out the theoretically best technical research design as defined in the previous chapter. The context in which the research had to take place posted some limitations to the applicability of this technical research design. These limitations are also discussed in Chapter 11. To work around these limitations, several modifications had to be made to the technical research design. In the following paragraphs the limitations from the context and necessary modifications to the technical research design are stated. The chapter ends with a conclusion in which a schematic representation of the modified technical research design as it was used in this research is shown.

4.1 Limitation I

During the timespan of this research there were no project teams planned to play the game. The groups that were planned to play the game were composed of different employees of Organization Z that work on the higher levels in the construction companies within Organization Z. The people in these groups do not work together on a daily basis, which made an observation of the teamwork of these groups impossible.

4.1.1 Necessary modifications

According to Hennink et al. (2011), interviews can best be conducted when the possibilities for observation are limited. Therefore, to solve this issue, interviews have to be held with members of the game groups before and after they played the game. To be able to replace the data from the observations that were used to establish behaviour on the projects, these interviews should include questions about the existing behaviour on the projects. However, also questions about attitude could be asked. When the findings about attitude from the interviews support the findings from the questionnaire that, as can be seen in Figure 15, should be focused on attitude, the information from both data gathering methods becomes more reliable.

From Figure 15 it becomes clear that quantitative data should be gathered via these interviews. To gather quantitative data a considerable amount of interviews should be held. Because of the time-constraint this would only be possible with a group of researchers. However, this research is conducted by a single researcher, which means that only a limited amount of interviews could be held. This makes that no quantitative information, but only qualitative data can be gathered via the interviews.

As was already stated in this research, it cannot be assumed that the results from a qualitative study are representative for a broader population. This means that the behaviours and attitudes that appear to exist on the projects based on the interview data, do not necessarily have to exist within all project teams. However, as was stated above, the findings from the interview become more reliable when the results from this interview are supported by the results from the questionnaire. As the questionnaire should be distributed among a large amount of people, it can be assumed that the results from this data gathering method are representative for the broader organization. Therefore, it is assumed that when the results from this questionnaire support the findings from the interviews about existing attitudes and behaviours on the projects, the results from the interviews can be considered representative for most project teams.

The benefit of using interviews during the research is their ability to gather large amounts of qualitative data. According to Hennink et al. (2011) a characteristic of qualitative data is the fact that it can answer 'why' and 'how' questions. This means that within the large amount of qualitative interview data that will be gathered in this research, also a lot of data could be obtained that gives explanations for the effectiveness of Game X which is established with help of this research. This data can help to determine recommendations towards Company X.

4.2 Limitation II

There was no possibility of designing a questionnaire specifically for this research, as a questionnaire was already developed and distributed by Company X. Sending an extra questionnaire could lead to overexposure to questionnaires on the side of the respondents, which could jeopardize the reliability of the answers that they give to the questions. There was also no possibility to distribute this same questionnaire after the game was played. Therefore, there was no opportunity to gather data about the attitude in the before and the after situation that can easily be compared.

4.2.1 Necessary modifications

The findings from the questionnaire that was designed by Company X had to be used. Company X sends this questionnaire to all participants of the game before they play it, which makes that the sample size of the questionnaire respondents is rather large. This means that quantitative data is gathered with help of this questionnaire, which can be assumed to be representative for most project teams. This means that it indeed can be assumed that the interview data (that were discussed in the previous paragraph) are representative for most project teams, if this data is supported by the information from this questionnaire.

As this questionnaire was not specifically designed for this research, it does not only include questions about attitude but also about behaviour. This makes that next to the data on attitude, this questionnaire could also support the data on behaviour from the interviews.

After the game is played, instead of a questionnaire, Company X distributed a so-called action-list to all participants. These lists are questionnaires designed by Company X that ask what actions participants prefer to undertake on their projects to create more successful teamwork. These action-lists, thus, in a way determine what behaviour could be shown after the game was played. Because the action-lists were distributed to many participants, quantitative data can be collected with these action-lists. This quantitative data is not directly comparable to the questionnaire data from the before situation, because not the same questions are asked. However, when the information from these action-lists supports the findings from the interviews that are conducted after the game was played, it can be assumed that the interview results are representative for most project teams. When both the before and after situation that are determined based on the interview data can be considered representative for most project teams, there is a possibility to compare these situations and determine the differences.

4.3 Limitation III

It was only allowed by Company X to conduct one observation during the game (as the presence of a researcher could affect the game-play). Unfortunately, practical complications made that the game that was observed was not a game to which interviewees participated. As every game-run is different, this made it difficult to compare the developments that seemed to occur based on the interview data, to the developments that occurred during the game.

4.3.1 Necessary modifications

To be able to gather information that tells something about the developments during the games in which the interviewees took part, the average game-run should be established. With the help of the developments in the game-run that was observed and comments from the game-leaders (who are present at all the games) on the frequency with which these developments occur in different game-runs, this average game-run could be determined.

4.4 Conclusion

The previous chapter ended with a schematic representation of the technical research design that theoretically would fit this research best. As was established in this chapter, multiple difficulties were encountered that limited the applicability of this theoretically correct technical research design. In this chapter, modifications that were needed to be made to the technical research design as it was defined in Chapter 3, to work around these limitations, were determined. These let to the modified technical research design which is shown in Figure 16. This technical research design was applied in this empirical research.
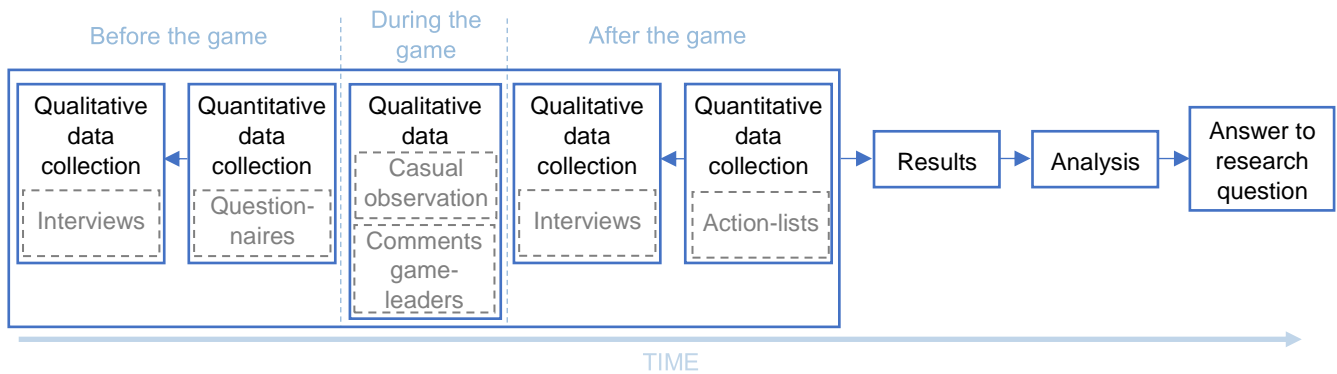
Figure 16. Schematic representation of technical research design used in this research

The interviews were designed according to the information on interview design that was stated in Appendix E. The interview that was conducted before the game was played can be found in Appendix I. The one that was conducted after the game was played can be found in Appendix J. The questionnaire that was developed by Company X and that was sent to the participants of the games few weeks before they played the game can be found in Appendix G. The action-lists that were designed by Company X can be found in Appendix H.

This technical research design is used to conduct the empirical research into the effectiveness of Game X. For clarity, in Figure 17 the research framework that was determined in paragraph 1.6 is combined with this technical design.
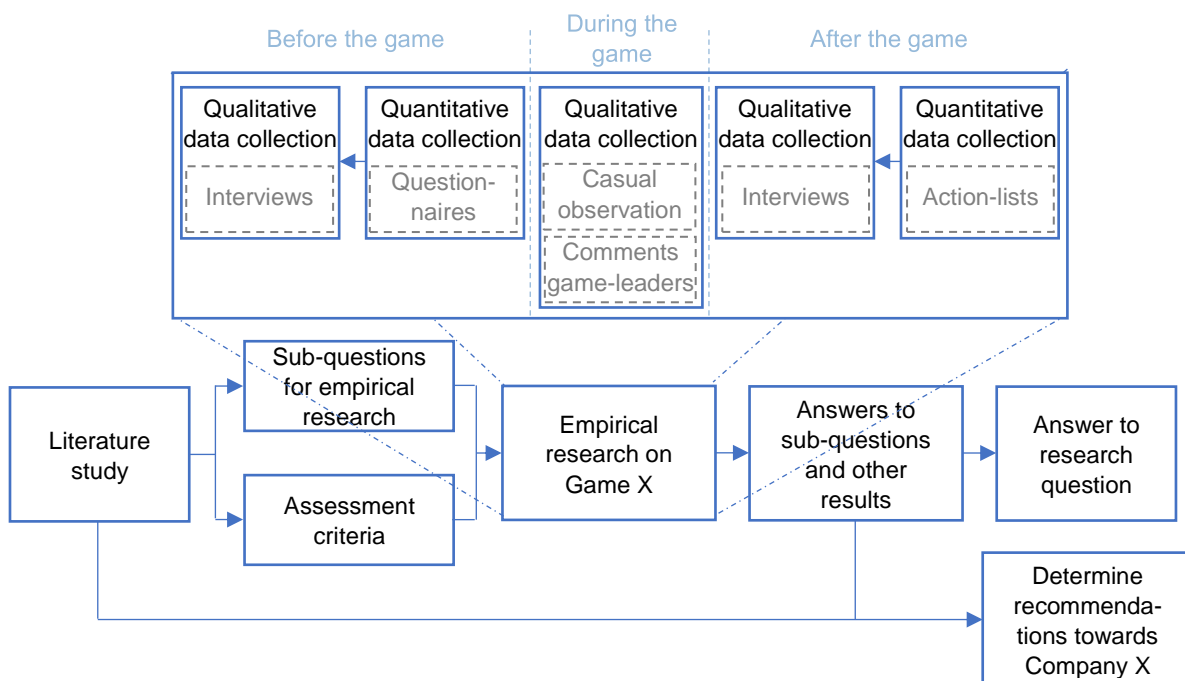
Figure 17. Combination of technical research design and research framework

Part III

Results and analysis

In this part the results produced by the quantitative and qualitative data that was gathered based on the technical research design are summarized. First, the results about the before situation and then the results about the after situation and the differences between these two situations are discussed. Subsequently, the developments during the game are determined. Based on these results answers are given to the sub-questions. Eventually, the data that can be used to present recommendations to Company X is considered.

Chapter 5 Before situation

In this chapter, the data that is collected about the existing behaviours and attitudes on the projects before the game is played, is discussed. As follows from Figure 16 this means that the data from both the interviews that were conducted before the game was played, and the questionnaires will be discussed. This data can help to answer the research question by answering the sub-questions:

- To what extent are behaviours shown that support successful teamwork and to what extent are behaviours shown that obstruct successful teamwork before Game X is played?
- Are participants aware of the need for a behavioural change before the game is played and do they know how to initiate it?

The first paragraph of this chapter describes the questionnaire and interview data that determines what 'supporting' and 'obstructing' behaviours are shown on the projects. The second paragraph determines the awareness amongst employees of the need for a behavioural change, based on the interview and questionnaire data. The chapter ends with a conclusion in which the information from the paragraphs is combined and the sub-questions that were stated above are answered.

As it becomes clear from Figure 16 the existing behaviours and attitudes can be established based on the interview data. When there is data from the questionnaire that supports the findings from the interviews and there is no data that contradicts these findings, it is assumed that the findings from the interview are representative for all participants that play the game. This is why in the paragraphs of this chapter, first, the data from the interviews are discussed and subsequently the way in which the data from the questionnaire supports or contradicts this data is determined.

5.1 Data on existing behaviour

In this paragraph the data that is collected about the existing behaviours on the projects is examined. First the information from the interviews about what behaviours exist on the projects is discussed. After this, the data from the questionnaire that tells something about the existing behaviours on the projects is stated. It is determined if the information from these questionnaires supports or contradicts the information from the interviews.

5.1.1 Interview data

According to Hennink et al. (2011) the data that is conducted from semi-structured interviews often is textual. To be able to analyse this data, it has to be coded. Coding is the process of sorting lengthy answers into specific response categories. Literature states two ways in which these categories could be set: the inductive and the deductive way. In the inductive way, the categories are made up by reading through the data and looking for dominant themes. In the deductive way, the surveyor preselects categories based on former knowledge, experience or literature study, and searches the data for information that falls into these preselected categories. As this research tries to establish the existence of the behaviours that were defined in paragraph 2.4.1, which obstruct or support successful teamwork, for the coding of the interview data deductive coding could best be used. The categories should be formed by the behaviours that were defined in paragraph 2.4.1.

For coding the large amount of textual data, the program Atlas.ti was used. This program allows for a structured way of coding. The codes were formed by the different behaviours defined in paragraph 2.4.1 and a code was assigned to a phrase of the interviews when the interviewee indicated in this phrase that a certain behaviour occurred within the project teams.

The number of times the different codes were assigned to the different interviews are shown in Appendix L. A summary of the information in this appendix is shown in Table 7. In this table, the sum of the number of times the codes were assigned to the different interviews is shown. To structure the information the codes are grouped per success factor. The darker blue the colour of the behaviour, the more often it was mentioned that this behaviour was shown on the projects before the game was played.

Table 7. Times certain codes were assigned to all interviews in total

Clear goals		
Obstruct		
Starting something without thinking	12	
Setting unclear goals	24	
Giving no feedback	11	
Use hidden agendas	1	
Total	**48**	
Support		
First think, then act	1	
Using a clear approach	3	
Evaluate, test	0	
Stimulate to get better	2	
Total	**6**	
Total for this factor	**54**	

Joint responsibility		
Obstruct		
Let the other person mess up	8	
Drop others	26	
Being disinterested	16	
Blame someone else	9	
Total	**59**	
Support		
Taking over tasks from someone else	1	
Want to do something for others	3	
Support each other	5	
Worry about the result	8	
Total	**17**	
Total for this factor	**76**	

Open communication		
Obstruct		
Withholding information	21	
Not discussing problems	16	
Being unclear and vague	31	
Gossip about other team members	0	
Total	**68**	
Support		
Fully inform each other	5	
Giving feedback	1	
Giving your opinion	1	
Being honest	7	
Total	**14**	
Total for this factor	**82**	

Mutual respect		
Obstruct		
Not listening to each other	5	
Point out patsies	4	
Not taking others seriously	19	
Impose your own opinion	2	
Total	**30**	
Support		
Listening to each other	10	
Involve the others	0	
Being tolerant	7	
Express appreciation	0	
Total	**17**	
Total for this factor	**47**	

Flexible adjustment		
Obstruct		
Making mistakes over and over again	23	
Ridicule new things	0	
Always defending the old	8	
Only looking back	4	
Total	**35**	
Support		
Learn from mistakes, evaluating	19	
Trying something new	6	
Being curious	5	
Seeing the value of every idea	4	
Total	**34**	
Total for this factor	**69**	

Showing initiative		
Obstruct		
Waiting	10	
Discourage others	2	
Focussing on barriers	5	
Act recklessly	0	
Total	**17**	
Support		
Looking forward	7	
Expressing ideas	7	
Doing proposals	6	
Responsibly taking risks	0	
Total	**20**	
Total for this factor	**37**	

As can be seen in Table 7, interviewees mentioned the existence of behaviours that obstruct successful teamwork more often than the existence of behaviours that support it. Unfortunately, this does not directly say something about the number of times this behaviour was shown on the projects in reality. A limitation of using the interview method is formed by the fact that in an interview all information is already interpreted by the interviewee before it arrives at the researcher.

This means that when a certain behaviour is mentioned less often in these interviews, it does not necessarily mean that this behaviour is shown less often on the projects. This limitation will be discussed in Chapter 11. Even though an interview does not really state the number of times a behaviour is shown, it is assumed that a behaviour that is mentioned often during the interviews, is also shown often on the projects. The less a behaviour is mentioned, the less it is shown on the projects. The results from this chapter will underpin this assumption. After all, when a behaviour is mentioned very often, its existence should be very clear which could mean that it is shown often.

Based on the information from Table 7, it can thus be assumed that, before the game is played more behaviours that obstruct successful teamwork were shown on the projects than behaviours that support it. It can also be assumed that the 'obstructing' behaviours that are shown most often are:

- Setting unclear goals
- Drop others
- Being unclear and vague
- Making mistakes over and over again

And that 'supporting' behaviours that are shown most often are:

- Learn from mistakes, evaluating
- Listening to each other

The fact that the contradicting behaviours 'making mistakes over and over again' and 'learn from mistakes' both have a high score in Table 7 was explained by the interviewees. They state that nowadays a lot of initiatives are undertaken to improve learning from each other and from other projects. However, these initiatives still have to be started and developed which makes that at the moment still very few things are learned from each other and from each other's mistakes. Other explanations that interviewees gave when they mentioned certain behaviours are described in Appendix K.

According to Table 7, the other 'supporting' behaviours are only mentioned few times, which makes that is assumed that these behaviours are not shown often on the projects.

5.1.2 Questionnaire data

The questions that are asked in the questionnaire are stated in Appendix G. Within the questionnaire there are questions that ask about the existence of the following behaviours:

- Listening to each other
- Showing appreciation
- Being honest and giving your opinion

These are closed-ended questions in the form of statements, the respondents can answer these questions by choosing an option from a five-point rating scale (totally agree, agree, neutral, disagree, totally disagree).

The results from these questions about the existence of these behaviours can support or contradict the abovementioned findings from the interviews. When the questionnaire data supports the data from the interviews, it is assumed that the existing behaviours that appear to exist on the projects according to the interview data also exist in most other project teams.

Listening to each other

The question 'If I say something people listen carefully' defines the presence of the behaviour 'listening to each other'. From the interview data was established that this behaviour is shown often on the projects as it was mentioned often during the interviews. In Figure 18 is shown what scores were assigned to this question by respondents of the questionnaire.
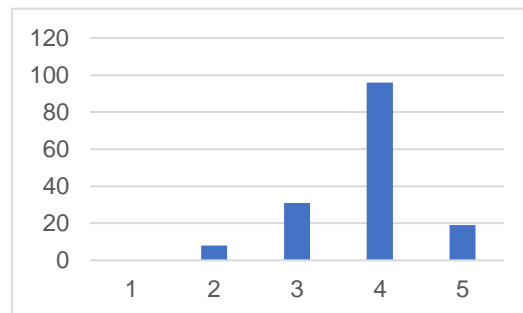
Figure 18. Assigned ratings to the question 'If I say something people listen carefully'

One can see that most respondents rated the question with a score 4. A score 4 means 'agree' so also according to the questionnaire results most respondents think the behaviour 'listening to each other' is shown often on the projects. Here the questionnaire results thus support the interview results.

Showing appreciation

The question 'Last week I received appreciation for the work that I delivered' defines the presence of the 'supporting' behaviour 'showing appreciation'. From the interview data was established that this behaviour is not shown often on the projects as it was a 'supporting' behaviour that was not mentioned often during the interviews. In Figure 19 is shown what scores were assigned to this question by the respondents of the questionnaire.
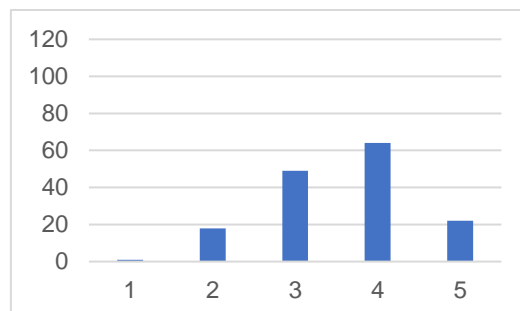
Figure 19. Assigned ratings to the question 'Last week I received appreciation for the work I delivered'

One can see that most respondents rated the question with a score 3 or 4. A score of 4 means 'agree', so these respondents think that appreciation was shown on the projects. A score of 3 means 'neutral'. From literature on questionnaire design it was learned that the 'neutral' option is often used by respondents as a 'don't know' option (Fink, 2003a). In this case, it would mean that the respondents did not know if appreciation was shown, which would make the results of this question rather negative. On the basis of this information one could state that in the before situation, appreciation was not always shown clearly on the projects. This again supports the results from the interview data.

Being honest and giving your opinion

The question 'In the last six months, someone confronted me with my behaviour' defines the presence of the 'supporting' behaviours 'being honest' and 'giving your opinion' (as confronting people with their work includes these two behaviours). From the interview data was established that these behaviours are not shown often on the projects, as these are 'supporting' behaviours that were not mentioned often during the interviews. In Figure 20 is shown what scores were assigned to this question by the respondents of the questionnaire.
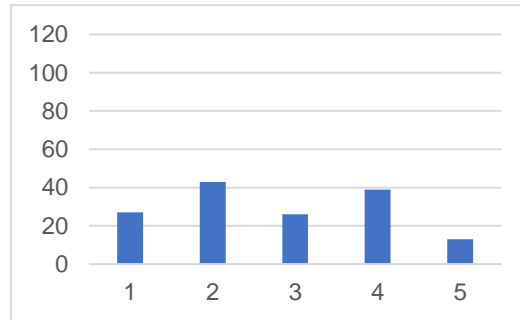
Figure 20. Assigned ratings to the question 'In the last six months, someone confronted me with my behaviour'

From the figure it becomes clear that most respondents rated the question with scores 2 and 4. Score 2 means 'disagree', so these respondents thought that no-one confronted them with their behaviour. Score 4 means 'agree', so these respondents thought that someone confronted them with their behaviour. One could conclude that not everybody confronts each other with their behaviour. Again, these results support the results from the interview data. It appears that some people do confront each other, but it does not happen often.

From this section it becomes clear that the questionnaire data supports the interview data about existing behaviours on the projects. This means that is assumed that the behaviours that seem to exist on the projects according to the interviews, are considered representative for most other project teams.

5.2 Data on existing attitude

In this paragraph the data that is collected about the existing attitude on the projects is examined. First the information from the interviews about what attitudes actually exist on the projects is discussed. After this, the data from the questionnaire that tells something about the existing attitudes on the projects is stated. It is determined if this information supports or contradicts the information from the interviews.

5.2.1 Interview data

From paragraph 2.4.2 it became clear that Game X aims at increasing the awareness amongst participants of the need for a behavioural change and of what they can do to initiate this. Therefore, to see what developments in attitude the simulation game could induce, this awareness has to be measured before and after the game is played.

The awareness of the need for a behavioural change can be established by assessing the attitude of participants towards the existence of behaviours that obstruct successful teamwork and behaviours that support this. When participants are aware of the fact that certain behaviours are shown too much and others are not shown enough, this means that they know that certain behaviours are 'good' for achieving successful teamwork and others are 'bad' and it tells that participants feel the need for a behavioural change.

The attitude of participants towards their own behaviour can be established by searching the interview transcripts for adjectives that indicate a feeling towards the behaviours that are shown on the projects. Examples of these adjectives are: too much, too little, better, good, bad, etc. When negative adjectives were used to describe a feeling towards an obstructing behaviour the code 'is shown too much' was used. When positive adjectives were used the code 'is not shown too much' was assigned. When a negative adjective was used to describe a feeling towards a supporting behaviour the code 'is not going well' was used. When a positive adjective was used the code 'is going well' was used.

In Table 8 the number of times the codes 'is not shown too much' and 'is shown too much' were assigned to the different obstructing behaviours are shown.

Table 8. Attitudes of interviewees towards obstructing behaviours that are shown on the projects

Clear goals	Is not shown too much	Is shown too much
Starting without thinking	1	6
Setting unclear goals	1	15
Giving no feedback	1	7
Use hidden agendas	0	1

Joint responsibility	Is not shown too much	Is shown too much
Let others mess up	2	2
Drop others	1	18
Being disinterested	2	8
Blame someone else	0	7

Open communication	Is not shown too much	Is shown too much
Withholding information	2	14
Not discussing problems	1	12
Being unclear and vague	1	23
Gossip about others	0	0

Mutual respect	Is not shown too much	Is shown too much
Not listening to each other	0	2
Point out patsies	0	3
Not take others seriously	1	10
Impose your own opinion	0	1

Flexible adjustment	Is not shown too much	Is shown too much
Keep making same mistakes	2	18
Ridicule new things	0	0
Defending the old always	0	5
Only looking back	0	2

Showing initiative	Is not shown too much	Is shown too much
Waiting	1	6
Discourage others	0	0
Focussing on barriers	0	4
Act recklessly	0	0

In Table 9 (partly on the next page) the number of times the codes 'is going well' and 'is not going well' were assigned to the different supporting behaviours are shown.

Table 9. Attitude of interviewees towards supporting behaviours that are shown on the projects

Clear goals	Is going well	Is not going well
First think, then act	1	18
Using a clear approach	2	14
Evaluate, test	0	5
Stimulate to get better	2	0

Joint responsibility	Is going well	Is not going well
Taking over tasks from others	1	8
Want to do things for others	5	4
Support each other	4	8
Worry about the result	5	16

Open communication	Is going well	Is not going well
Fully inform each other	4	14
Giving feedback	1	9
Giving your opinion	1	6
Being honest	5	9

Mutual respect		
	Is going well	**Is not going well**
Listening to each other	12	2
Involve the others	3	15
Being tolerant	2	9
Express appreciation	2	15

Flexible adjustment		
	Is going well	**Is not going well**
Learn from mistakes, evaluating	13	2
Trying something new	3	1
Being curious	2	0
Seeing the value of every idea	1	1

Showing initiative		
	Is going well	**Is not going well**
Looking forward	3	2
Expressing ideas	3	0
Doing proposals	3	0
Responsibly taking risks	0	0

The fact that in Table 8 all the obstructing behaviours score higher on the code 'is shown too much' than on the code 'is not shown too much', means that respondents know that showing 'obstructing' behaviour is not good. The same goes for the supporting behaviours, but vice versa.

The 'obstructing' behaviours that are mentioned most often to be shown too much are:

- Being unclear and vague
- Drop others
- Making mistakes over and over again
- Setting unclear goals

Apparently, the participants mostly see the need for a behavioural change on these behaviours.

It is interesting to see that the behaviours that were mentioned to exist most often on the projects also are considered the most to be shown too much on the projects. This supports the assumption that the more a behaviour was mentioned in the interviews, the more it is shown on the real projects.

The 'obstructing' behaviours within the success factor 'showing initiative' were not mentioned often during the interviews (as can be seen in Table 7) and also the scores on the tables in this section (Table 8 and Table 9) are not high. This means that the interviewees do not consider the behaviours within this success factor in general. Apparently, they are not aware of the fact that these behaviours are needed to create successful teamwork.

Furthermore, it is interesting to mention that three of the four behaviours that obstruct the achievement of the factor 'open communication' are considered to be shown too much. However, in Table 9 the behaviours that support the achievement of this factor do not score high on the code 'is not going well'. This could mean that respondents do know they are expressing the wrong behaviour, but that they do not know with what behaviour this should be replaced to create open communication and improve communicative skills.

The behaviours 'learn from mistakes' and 'listening to each other' are the only behaviours that have a relatively high score on the code 'is going well'. This supports the findings from the interviews that state that these are the 'supporting' behaviours that are shown most often on the projects. This again supports the assumption that the more a behaviour was mentioned in the interviews, the more it is shown on the real projects.

5.2.2 Questionnaire data

As it became clear from the introduction to the previous section, the awareness amongst participants of the need for a behavioural change and of what they can do to initiate this, has to be determined. The questions that are asked in the questionnaire are stated in Appendix G. The question 'What is the first issue you would tackle to create more successful teamwork' could say something about the awareness amongst participants of the need for a behavioural change. After all, the first thing the participants like to tackle is probably the aspect of teamwork on which they mostly see the need for a behavioural change.

The results from this question support or contradict the abovementioned findings from the interviews. When the questionnaire data supports the data from the interviews, it is assumed that the existing attitudes that appear to exist on the projects according to the interview data, also exist on most other project teams.

In Appendix M the issues that were mentioned by the respondents are stated. Also, the numbers of times that the issues were mentioned are graphically shown. From Appendix M it becomes clear that the issues that by far were mentioned the most, are:

- Learning from each other and using each other's knowledge
- More working towards a joint interest/towards the project's best interests
- Share more (interests, expectations, remarks)

These issues respectively have to do with eliminating the behaviours:

- Making mistakes over and over again
- Drop others
- Being unclear and vague

This means that could be assumed that according to the information from the questionnaires the participants mostly see the need for a behavioural change on these behaviours. The findings from the interviews also state that participants mostly see the need for a behavioural change on these behaviours. The questionnaire data thus supports the interview data, which means that the attitudes that were defined based on the interview data can assumed to be representative for most other project teams.

5.3 Conclusion

With the information that was described in this chapter the two sub-questions that were stated in the introduction of this chapter can be answered.

To what extent are behaviours shown that support successful teamwork and to what extent are behaviours shown that obstruct successful teamwork before Game X is played?

Before the game is played more obstructing than supporting behaviours are shown on the projects. The obstructing behaviours that are shown most often are:

- Setting unclear goals
- Drop others
- Being unclear and vague
- Making mistakes over and over again

The supporting behaviours that are shown most often are:

- Learn from each other, evaluating
- Listening to each other

The remaining supporting behaviours are not shown often on the projects. These findings were supported by findings from the questionnaire, which means that is assumed that these behaviours also exist within most other project teams.

Are participants aware of the need for a behavioural change before the game is played and do they know how to initiate it?

Participants are aware that 'obstructing' behaviours are bad and supporting behaviours are good when successful teamwork has to be created.

Participants are most aware of the need for a behavioural change on the behaviours:

- Setting unclear goals
- Drop others
- Making mistakes over and over again
- Being unclear and vague

For the first three behaviours, people are aware with what behaviours these behaviours have to be replaced. However, the participants do not seem to know how to create open communication and eliminate the behaviour 'being unclear and vague'.

Furthermore, participants seem to be unaware of the need for considering the behaviours within the success factor 'showing initiative' (looking forward, expressing ideas, doing proposals, responsibly taking risks) to create successful teamwork.

These findings were supported by findings from the questionnaire, which means that is assumed that these attitudes also exist within most other project teams.

The answers to these two sub-questions together state the existing behaviours and attitudes on the projects before the game was played. By comparing these existing behaviours and attitudes to those that exist on the projects after the game is played, developments in attitude and behaviour can be defined. This will be done in the next chapter.

Chapter 6 After situation

In this chapter, the data that is collected about the existing behaviours and attitudes on the projects after the game is played is discussed. As follows from Figure 16 this means that the data from both the interviews that were conducted after the game was played and the action-lists will be discussed. This data can help to answer the research question by answering the sub-questions:

- Are less behaviours shown that obstruct successful teamwork and are more behaviours shown that support successful teamwork after Game X is played?
- Are participants more aware of the need for a behavioural change and of what they can do to initiate it after they played the game?

The first paragraph of this chapter describes the interview and action-list data that determines if a change in behaviour did occur on the projects. The second paragraph determines if a change in awareness amongst employees of the need for a behavioural change and of what they can do to initiate this did occur on the projects. The chapter ends with a conclusion in which the information from the paragraphs is combined and the sub-questions that were stated above are answered.

As it becomes clear from Figure 16 the existing behaviour and attitudes can be established on the basis of the interview data. When there is data from the action-lists that supports the findings from the interviews and there is no data that contradicts these findings, it is assumed that the findings from the interview are representative for all participants that play the game. This is why in the paragraphs of this chapter, first, the data from the interviews are discussed and subsequently the way in which the data from the action-lists supports or contradicts this data is determined.

6.1 Data on behavioural change

In this paragraph the data that is collected about the existence of a behavioural change is examined. First the information from the interviews about this behavioural change on the projects is discussed. After this, the data from the action-lists that tells something about this behavioural change on the projects is stated. It is discussed if the information from these action-lists supports or contradicts the information from the interviews.

6.1.1 Interview data

Only four interviews were conducted after the game was played, whereas nine interviews were held before the game was played. In Chapter 5 the interviews that were conducted before the game was played were coded on the basis of the behaviours that were named in paragraph 2.4.1. The different behaviours formed the codes. The results from this coding were analysed based on the number of times certain codes were assigned.

This method could be suited when as much as nine interviews are held. Within this big number of interviews, the number of times certain codes are assigned can differ a lot from code to code. However, when only four interviews are held it would not be useful to consider the number of times the codes were assigned. When only four interviews are coded, the different codes only get assigned few times, which would make that differences are difficult to register. This makes it difficult to use deductive coding, in which predefined codes are used.

Another method of coding and analysing interviews is the inductive way. As was already described in paragraph 5.1.1, with inductive coding, codes are made up while reading the interview transcripts. When a certain item frequently comes forward in the different interviews, a code is designed which can be connected to these phrases of the text. This was done for the interviews that were conducted after the game was played.

All interviewees mention during the interviews that they did not witness a behavioural change on the projects. Therefore, the code 'no behavioural change occurred on the projects' was designed and assigned to the phrases of the text in which this was mentioned. The code got assigned nine times in total. Considering that only four interviews were coded, all interviewees probably have mentioned the non-existence of a behavioural change multiple times.

The fact that this code was assigned this many times to all different interviews, should be enough to state that indeed no behavioural change occurred on the projects. This means that the behaviours that are shown on the projects in the situation after the game was played are still the same as in the before situation.

6.1.2 Action-list data

The action-lists also could provide information about the behavioural change. The questions that were asked in the action-lists are stated in Appendix H. The question that could provide information about the behaviour on the projects after the game was played is: 'What initiative will you undertake to make the program Intervention Y successful'. If the participants state in these initiatives that they would like to start expressing other behaviours, this information shows that probably a behavioural change will occur on the projects when the participants really start to carry out these initiatives. However, when the initiatives do not involve a behavioural change, this tells that probably a behavioural change on the projects will stay away even if the participants start to carry out the initiatives they defined. This would support the results from the interviews about the absence of a behavioural change that were discussed above.

In Appendix N a summary of the mentioned initiatives is given in graph form. The initiative that is by far mentioned most is the initiative 'implementing project approach using V-model and gate reviews on projects'. This initiative does not include a behavioural change but only a structural change on the projects. When the reasoning that was described above is followed, this would mean a behavioural change will not occur on the projects. This supports the findings from the interview.

The fact that the action-list results support the results from the interviews makes that is assumed that the absence of a behavioural change on the projects is representative for most other project teams.

6.2 Data on attitude change

In this paragraph the data that is collected about the existence of a change in attitude on the projects is examined. In the previous chapter, the attitude of the participants before the game was played was described as the awareness amongst the participants of the need for a behavioural change and of what they can do to initiate this. In this paragraph, first the data from the interviews that provides information about whether or not this awareness increased is discussed. After this, the data from the action-lists that tells something about this change in awareness is stated. It is discussed if this information supports or contradicts the information from the interviews.

6.2.1 Interview data

According to theory about behavioural change, it is still possible that an attitude change occurs, despite the fact that a behavioural change stays away (Tiggelaar, 2010). The awareness of the need for a behavioural change amongst the participants before the game was played, was established by determining the attitudes of participants towards the expression of 'obstructing' and 'supporting' behaviours. To determine if the awareness of the need for a behavioural change increased, the transcripts of the interviews that were conducted after the game was played were also searched for attitudes of employees towards the 'obstructing' and 'supporting' behaviours that were mentioned in paragraph 2.4.1.

From the previous chapter it became clear that in the before situation participants were mostly aware of the need for a behavioural change on the behaviours 'being unclear and vague', 'drop others', 'making mistakes over and over again' and 'setting unclear goals'. However, it seemed to be unclear to the participants how they could eliminate the behaviour 'being unclear and vague' and achieve open communication. Next to this, the participants seemed to be unaware of the fact that the behaviours within the success factor 'showing initiative' (looking forward, expressing ideas, doing proposals, responsibly taking risks) also are important to consider when creating successful teamwork.

However, while searching the interview transcripts for attitudes towards expressed behaviour, the attitude of participants towards the behaviour 'waiting' stood out. In paragraph 2.4.1 is shown that this behaviour belongs to the behaviours that obstruct the achievement of the success factor 'showing initiative'. In all interviews came forward that the interviewees had become aware of the fact that this was a behaviour that was expressed too much on the projects. The employees started to see that they had to carry out more initiatives themselves when change is pursued, instead of blaming others and keeping waiting until things change.

When one searches the interview transcripts to determine what kind of initiatives the interviewees undertook, it becomes clear that most initiatives that were undertaken by the interviewees were aimed at implementing a new structure on the projects. These initiatives do not include a behavioural change, which could mean that the participants are still unaware that a behavioural change has to occur. According to the information above, they are more aware that actions have to be undertaken, but apparently, they do not see that these actions have to be directed towards a behavioural change.

However, it can also be found that a considerable amount of the initiatives had to do with improving communication skills, which does include a behavioural change. It was established that the participants were already aware of the need for a behavioural change on the behaviour 'being unclear and vague' before the game was played. As it became clear from the previous chapter, however, it seemed like the participants were unaware of what they could do to initiate this behavioural change. According to this information from the interviews that were conducted after the game was played, certain participants became aware of the actions that they could undertake to initiate a behavioural change on the behaviour 'being vague and unclear'.

6.2.2 Action-list data

The initiatives that were defined by the participants in the action-lists can also say something about the attitudes of participants towards the 'obstructing' and 'supporting' behaviours. In Appendix N the initiatives that the participants wanted to undertake to create successful teamwork are stated.

The initiative 'really applying what was learned, just doing it!' was suggested often, which means that participants became aware of the fact that they should stop waiting and have to undertake initiatives themselves when successful teamwork is pursued. This supports the findings from the interviews about the increased awareness amongst participants that the behaviour 'waiting' is shown too much on the projects.

The fact that by far most participants mention the initiative 'implementing project approach using V-model and gate reviews on projects', matches the findings from the interviews that most participants want to undertake initiatives that are aimed at implementing a new structure on the projects. These 'structural' initiatives do not involve a behavioural change. This supports the idea that a lot of participants do see they have to undertake initiatives, but do still not see the need for a behavioural change and thus do not direct their initiatives towards it.

Other initiatives that were mentioned somewhat more often than the others are 'confronting people with their behaviour' and 'communicate more'. These initiatives include a behavioural change to improve open communication. This supports the findings from the interview that suggest that participants became more aware of what they could do to improve the behaviours within the success factor 'open communication'. The fact that the action-list results support the results from the interviews makes that is assumed that the change in awareness is representative for most other project teams.

6.3 Conclusion

With the information that was described in this chapter the two sub-questions that were stated in the introduction of this chapter can be answered.

Are less behaviours shown that obstruct successful teamwork and are more behaviours shown that support successful teamwork after Game X is played?

No behavioural change occurred on the projects. This means that the behaviour that was shown in the before situation is still shown on the projects after the game is played. The absence of a behavioural change was supported by quantitative findings from the action-lists, which means that this absence of a behavioural change is assumed to be representative for most other project teams.

Are participants more aware of the need for a behavioural change and of what they can do to initiate it after they played the game?

Participants became more aware of the importance of the behaviours that support the achievement of the success factor 'showing initiative' (looking forward, expressing ideas, doing proposals, responsibly taking risks). The participants especially became aware that the behaviour 'waiting' is shown too much on the projects and that they have to undertake initiatives themselves when successful teamwork is pursued.

Most participants undertook initiatives to implement another structure on the projects which does not include a behavioural change. It could be assumed that most participants understand that they have to undertake initiatives themselves, but are still not aware of the need for a behavioural change and thus do not aim their initiatives towards a behavioural change. However, also some participants determined initiatives to improve communication skills. These participants thus became aware of what they could do to change their behaviour within the success factor 'open communication'. This means that for some participants it did became clear what kind of behavioural change could be initiated by themselves.

These findings were supported by findings from the action-lists, which means that is assumed that these developments in awareness also exist within most other project teams.

Chapter 7 During the game

In this chapter, the data that is collected about the developments during the game is discussed. As follows from Figure 16 this means that the data from the observation during the game and the comments from the game-leaders will be discussed. In the previous chapter was established that no behavioural change occurred on the projects, but only a change in attitude developed. When the developments during the game can be connected to these developments in attitude, the effects of the simulation game on the attitude can be established. This means that the information in this chapter can answer the following sub-question:

- Can the differences between the before and the after situation be caused by what happens during the simulation game?

In this chapter, first, an average game-play is described, which was developed based on the observed developments during the game and the comments of the game-leaders. After this, the connections that could be made between certain aspects of this game-play and the developments in attitude that occurred between the before and after situation are determined. In the conclusion of this chapter, the answer to the sub-question that is stated above is given.

7.1 Average game-play

In this paragraph the developments within an average game-play are determined. The structure of the two-day intervention and the game-plays was already described in Chapter 1. To refresh the memory, first the structure of the two-day intervention is repeated. Subsequently, the developments that occur during an average game-play based on the data from the observation and comments from game-leaders are described.

7.1.1 Structure of the two-day intervention

- During the first morning of the intervention, the participants view several presentations. During these presentations, the new project structure is explained.
- The game starts after these presentations.
- During the first afternoon of the game, the participants have to design the hydrogen plant.
- During this afternoon the game is interrupted several times with a lecture about the application of gate-reviews (a part of the new project structure). This alternation of lectures and practice is used to teach the participants how to apply the new structure to a design process. After the lectures, the participants have the chance to use the new knowledge during the game.
- At the first evening of the game, the design has to be finished and materials have to be ordered which will be used to build the plant during the second day.
- During the second morning of the game, the participants have to build the design they made the day before.
- During this morning there are no interruptions anymore, the participants have to define how they will handle the execution themselves.
- At the end of the second morning, the hydrogen plant has to be finished and is tested.
- During the second afternoon of the game a debriefing session is held. During this session, participants get the chance to comment on the issues that arose during the game, and on each other's behaviours. During this debriefing session, the previously mentioned action-lists are filled in.

7.1.2 Developments during an average game-play

As was already mentioned in 3.2, for the observation during the game casual observation was used. During this casual observation, situations on the basis of which participants could change their attitude were captured in field notes. The notes that were taken during the game were too extensive to include in this research report. However, a summary of the situations that were described in these field notes is given in this section. Only the situations that often occur during other game-runs according to the game-leaders are described in this section. In the following paragraph, the way in which these situations could have led to the change in attitude that was measured on the projects is determined.

- At the start of the game, the teams show successful teamwork. There is a general start with a group-talk. People ask each other how things should be done. Participants that play representatives from different companies work together with each other in teams.
- When the group-talks are over, the participants go back to their own 'islands'. They start executing their tasks and do not communicate what they do, what they learn and what problems they encounter. They try to solve their own problems.
- This situation persists up to the point that another group-talk is held in which information is shared and communicated again.
- The degree to which the project team members get isolated from each other depends on the speed with which group-talks follow each other.
- The longer it takes before a group-talk is organised, the more the different team members get isolated from each other. Eventually, this leads to chaos situations in which people do not know anymore what other people are doing and what they have to do themselves. According to comments from the game-leaders, these situations mostly occur during day two in which no connection is made anymore to the theory.
- These situations often lead to interventions (sometimes induced by the game-leaders). During these interventions, people get the opportunity to share their feelings and issues honestly. People are asked to look at themselves and their share in this situation. These interventions often increase the awareness about the importance of the group-talks and that information should be shared more.
- These interventions, however, often have no clear conclusion. This makes it hard for participants to act upon the issues that were shared during the interventions and participants fall back in their original behaviour.
- This goes well for a certain period. It goes well for a longer period if group-talks follow each other with more speed. When again not enough group-talks are organised, the team derails again and a new intervention is needed.

7.2 Connection between differences and aspects of game-play

In the previous paragraph, the situations that occurred during the game, which could have led to developments in attitude were described. The fact that, according to the game-leaders, these situations often occur during different game-runs, makes it worthwhile to search the connection between these situations and the developments in attitude that were measured on the projects. When these situations could induce the measured developments, it could be assumed that the differences in attitude between the before and after situation are due to the application of the game. In this paragraph, first, the development in attitude that was measured on the projects is summarized to refresh the memory. Subsequently, ways in which the abovementioned situations could have caused these developments are discussed.

7.2.1 Development in attitude

The attitude towards the behaviour 'waiting' changed. This means that participants of the game became aware of the fact that this behaviour was shown too often on the projects. They started to see that when change is pursued, employees should not keep waiting till something happens but have to undertake initiatives themselves. Most participants of the games, however, go to work with implementing the new structure on the projects. A smaller part of the participants also takes initiatives to change certain communicating behaviour.

7.2.2 Development in attitude vs events during game-play

From the section above it becomes clear that the participants' awareness of the fact that employees on the projects are waiting too much, increased. This increased awareness could be caused by the fact that during the game, often situations arise in which participants do not know anymore what to do. When someone would have done something to improve this in time, this situation would not have occurred. This could form a teaching moment for participants during which they learn that they have to stop waiting until something happens, but have to undertake action.

Also, the interventions that are held during the game could make participants experience that they should start undertaking actions themselves. According to the abovementioned information, these interventions often focus on what participants themselves could contribute to the situation. These moments could create the awareness amongst participants that, if something has to change, they have to undertake actions themselves.

From Chapter 6 it became clear that multiple participants decided to undertake actions to improve their communicative skills. This could be caused by the fact that the game-runs often tend to get stuck on the communication aspect, especially during the second day of the game. During the interventions, participants become aware of the importance of communication and can share with each other where this goes wrong. These interventions could form teaching moments during which participants become aware of what actions could be undertaken to improve communication on the projects. Next to this, also the debriefing session in which participants can comment on each other's behaviour could form teaching moments for the participants. From these confrontations could become clear what they could do differently to create open communication.

According to the conclusion of Chapter 6, most participants decided to undertake actions to implement the project structure that was explained during the intervention. The fact that most participants choose to undertake such an initiative, could be caused by the fact that during the intervention a lot of attention goes to the implementation of this new structure. Especially during the first day, the participants are guided through the process of applying this structure to a design process. From the alternation of theory and practice, the participants learn lessons about how to implement this structure. This could be the cause of the fact that most participants choose to go to work with this new structure instead of with changing their behaviour. It is possible that the participants are not aware that they also learned things about behaviour, because the lessons they learned about the structure are way more clear.

7.3 Conclusion

With the information that was described in this chapter the sub-question that was stated in the introduction of this chapter can be answered.

Can the differences between the before and the after situation be caused by what happens during the simulation game?

From the information in this chapter it became clear that the developments in attitude that were measured on the projects can be explained by certain events from an average game-run.

The situations that arise during the game in which participants do not know anymore what to do, could make them see that if someone had done something, these situations would not have existed. These teaching moments could cause the change in attitude towards the behaviour 'waiting'. Furthermore, also the interventions during the game could form teaching moments during which participants realise that they have to undertake actions themselves.

From the interventions and the debriefing sessions, the participants could learn what concrete actions to undertake to improve the communication on the projects. Next to this, during the intervention, a lot of attention goes to the implementation of the new project structure. From the alternation of theory and practice, the participants learn how to implement this structure. This could be the cause of the fact that most participants state that they want to go to work with implementing the new structure instead of with changing their behaviour.

As is learned from the summary above, the developments in attitude that were measured on the projects can be linked to events that frequently come back in multiple game-runs. Based on this information, one could assume that the development in attitude, which forms the difference between the before and after situation, can be connected to the application of Game X.

Chapter 8 Information for recommendations

In Chapter 2 it was established that Game X could be considered effective when a shift in behaviour occurs from behaviour that obstructs successful teamwork towards behaviour that supports this. As follows from the conclusion of Chapter 6, this behavioural change was not observed on the projects, which means that the effectiveness of Game X should be increased or other solutions to create successful teamwork on the projects have to be applied. In this research, recommendations to Company X are determined which involve ways to increase the effectiveness of the simulation game and alternative solutions that could help to create successful teamwork.

In this chapter, the data that was gathered from the participants during this research that can help to determine these recommendations is discussed. Firstly, the opinions of participants on the intervention can provide information about ways in which this intervention could be improved. Based on this information, recommendations could be determined towards Company X that describe ways in which the effectiveness of the intervention can be increased. Secondly, the participants could have their own idea about what is causing the existence of obstructing behaviours on the projects and what solutions could solve this. On the basis of this information recommendations could be determined towards Company X that describe alternative solutions to create successful teamwork on the projects.

The first paragraph of this chapter determines the causes the participants named for the existence of obstructing behaviours on the projects, and the solutions they suggest. In the second paragraph the opinions of participants on Intervention Y are discussed. The improvements that could be made to the intervention according to the participants are stated. In the conclusion of this chapter the alternative solutions and improvements that were mentioned are summarized. In Chapter 10 these alternative solutions and improvements are used to present recommendations to Company X.

8.1 Causes and solutions

During the interviews that were conducted before the game was played, while answering the questions, the participants also mentioned why they thought they showed behaviour that obstructs successful teamwork. The causes that were mentioned most often are described below. The participants also suggested solutions to deal with these difficulties. Per cause the solutions that were suggested are stated. In the recommendations to Company X, these solutions could be suggested to show other ways in which successful teamwork could be created.

8.1.1 Cause I

The cause that was mentioned most often had to do with the structure of the projects of Organization Z. These projects are structured in such a way that all participating companies in a project have their own financial goals and their own budgets. According to the interviewees, this structure sometimes causes difficulties when something that is good for the project's end result is bad for one company's financial results. Then conflicts between the joint project goals and the company's goals arise and successful teamwork is hindered.

Solution

To solve this problem, many interviewees suggested the solution of a 'shared wallet', which means that there is one budget for the entire project. According to the interviewees, with a 'shared wallet' the financial goals of the participating companies and the joint project goals cannot conflict anymore, because the companies all loose when the project loses and they all gain when the project gains.

Also, during the interviews after the game was played this 'shared wallet' was mentioned as being a solution to the existence of obstructing behaviour on the projects. The fact that, even after the participants played the game and underwent an intervention which is aimed at creating more successful teamwork, they still state that this 'shared wallet' is a solution to the existence of obstructing behaviour, makes it seem worthwhile to look into this solution.

8.1.2 Cause II

Another cause that is mentioned quite often is the fact that this behavioural change process is a learning process and learning processes take time. Interviewees point out that developments have already set in and things are already way better than ten years ago, but such a change in behaviour takes time. Next to this it practically takes a lot of time to let all employees of Organization Z play the game.

Solution

Give it time. Most interviewees are confident that when more people played the simulation game, the developments in behaviour and attitude will intensify. This does still not mean that the intended change in behaviour will occur, but it means that when another research would be conducted somewhere in the future a better result may be found.

8.1.3 Cause III

A cause that was mentioned often, especially during the interviews that were conducted after the game was played, was the fact that executives do not seem to support successful teamwork. During the after interviews, some interviewees pointed out that when they wanted to undertake initiatives (as they became aware that initiatives had to be undertaken) to improve successful teamwork, they were retained by their superiors. Often the interviewees were held back when extra money or time was needed or when another, more integral, project structure with a 'shared wallet' was suggested during the set-up of a new project.

Solution

The interviewees mentioned that it is important for all superiors within Organization Z to play the game. In this way they become aware of what new developments are pursued and that they should keep room for their employees to create these developments. Furthermore, a clear delineation of what is exactly pursued with the game and Intervention Y should become available. In this way, it becomes easier to demonstrate that a certain initiative helps to achieve the goals of the program Intervention Y. In the current situation, there is no clear delineation of the goals and actions to be undertaken, which makes it hard to determine when an initiative really contributes to these non-SMART goals.

8.1.4 Cause IV

The last cause for the existence of obstructing behaviours on the projects that was mentioned several times was the fact that employees often do not know what project team members from other companies actually are doing. This ignorance causes miscommunications, extra work, conflicts and so on and thus does not support a successful way of teamwork within a project team.

Solution

The interviewees know from own experience that this ignorance occurs way less when the project team members from different companies physically work together on the projects. This means that a solution to this cause could be to create places where the project teams can work together every day.

When these work places are designed in such a way that communication is stimulated, this cause could be even more eliminated. Such a communication stimulating work place could, for instance, be furnished with desks behind which you have to stand so walking around and communicating with other project team members is stimulated. Less closed-off rooms and more open spaces also stimulate communication. Next to the creation of a communication stimulating workplace, this ignorance could also be decreased when a clear and good system to share information is developed. With such a system the different project team members would know what all other team members are doing and where certain information can thus be found.

8.2 Opinions of participants

Both the questionnaires and interviews produced data about the opinions of participants on Intervention Y. In this paragraph, first the opinions that could be derived from the questionnaires are discussed. After that, the comments on the intervention that the interviewees shared during the interviews are described. These opinions and comments can help to define what improvements could be made to the simulation game and Intervention Y. In the recommendations to Company X these improvements could be suggested to show how the intervention could become more effective.

8.2.1 Opinions from questionnaire

The scores on the questions 'I am motivated to join the program Intervention Y' and 'I know what is expected of me in the program Intervention Y' provide information about the way in which the participants viewed the intervention before they played the game. When this initial view obstructs the effectiveness of the intervention, this has to be included in the recommendations towards Company X.

The result of the question 'I am motivated to join the program Intervention Y' is shown in Figure 21.
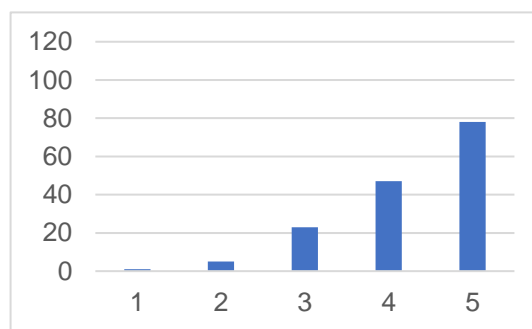
Figure 21. Score of the questionnaire question
'I am motivated to join the program Intervention Y

The majority of the respondents rated this question with a score 5, which means 'totally agree'. This means that according to the questionnaire most respondents are motivated to join the program Intervention Y. Motivated participants will most likely take the game seriously and try to implement the lessons learned on their work. This means that it can be assumed that this result will not have a negative effect on the effectiveness of the game. No recommendations are necessary that state improvements to the intervention that would motivate the employees more to join the program Intervention Y.

In Figure 22 the score on the question 'I know what is expected of me in the program Intervention Y' is shown.
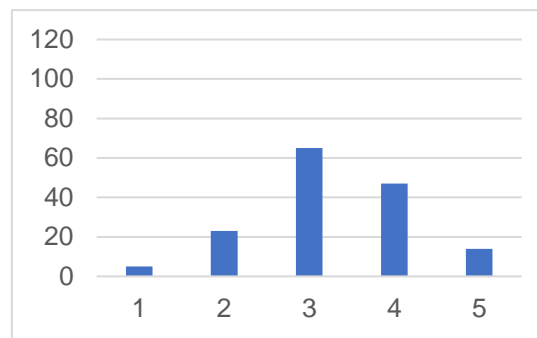
Figure 22. Score of the questionnaire question
'I know what is expected of me in the program Intervention Y

From Figure 22 it becomes clear that most respondents rate this question with the scores 3 and 4, where score 3 is assigned more often. Score 4 means that people know what is expected of them in the program Intervention Y. However, more people assigned score 3, which means that people do not really know what is expected of them, but also do not really not know what is expected of them. In short, to most participants it is not entirely clear what is expected of them in the program Intervention Y.

When participants are not sure what is expected of them, this could negatively influence the degree to which they undertake initiatives to improve their behaviour. After all, it is not clear to them what initiatives should be undertaken. Next to this, when it is not made clear what has to be done, there is a chance that participants misunderstand the program and start focussing on parts that are not most important. This could be the case at Company X. As it became clear from the previous chapters, most participants started to undertake initiatives to change the structure on the projects. However, the most important goal of the simulation game was to create a behavioural change on the projects. As it was apparently not clear to the participants that this behavioural change was expected of them, they started to focus on other parts of the intervention that were not most important.

The fact that it is not clear to most participants what is expected of them in the program Intervention Y thus could have a negative effect on the effectiveness of the simulation game. Therefore, it should be recommended to Company X to improve the intervention, by making clear to participants on forehand that also a behavioural change is pursued with help of the intervention.

8.2.2 Opinions from interviews

During the interviews, especially during the interviews that were conducted after the game was played, the participants mentioned some comments they had on the intervention. These comments could help to determine what aspects of the intervention could be improved and in what way. The comments that were mentioned are described below.

Also use the window effect of simulation games during day two of the game

During day two, the structure of the game makes that participants show the behaviour that they show on the real projects and that the consequences of this behaviour are very clear to the participants. However, the game does not really show them how they could change and improve this behaviour. The game teaches them what they should not do, but it does not teach them what they should do.

During the first day, this teaching is done right. The desired new structure is shown and explained and then the participants can experience the consequences of this structure when applying it during the game. The window effect is rightly used during this first day. It would be better to also use this window effect during day two. This means an alternation of lectures and game-play should be applied. The lectures should provide a window in which the behaviour that is desired is described. These windows then make clear to the participants what they will have to work on during the game.

To make clearer to the participants why this new behaviour is needed on the projects, it could be connected to the new project structure that was presented during the presentations prior to the game. During the lectures, the behaviours that are mentioned could be coupled to different aspects of the new structure for which this behaviour would be needed. In this way, it is made clear to the participants what behaviour is desired and why this is desired.

Shorten the presentations and make them more 'soft'

The interviewees mentioned during the interviews that the presentations prior to the game were too long. Too much information was sent to the participants at once, which made that most information was not captured by them. The presentations thus have to be shortened, or several presentations have to be given at other moments to minimize the amount of information that is received by the participants at once.

Next to this, according to the participants, the presentations only focus on the explanation of the new structure that has to be implemented on the projects. In this way, participants start to think that learning about the structure is the main goal of the game, while the main goal of the game actually is to create a behavioural change. This issue also came forward from the questionnaire data which was described in the previous section. Based on the questionnaire data was determined that the intervention should be improved, by making clear to the participants on forehand that also a behavioural change is pursued with help of this intervention. This improvement could be made to the intervention, by mentioning the behavioural change that is desired, during the presentations prior to the simulation game. In this way, it is made clearer to the participants that the implementation of the new structure has to be associated with a change in behaviour.

8.3 Conclusion

In this chapter different improvements that could be made to the intervention to improve its effectiveness were determined, as well as some alternative solutions for creating successful teamwork. The improvements and alternative solutions that should be considered when stating recommendations to Company X are summarized in this paragraph.

8.3.1 Alternative solutions

- Revise the structure of the projects of Organization Z and consider a 'shared wallet' solution.
- Give it time and conduct another research into the existence of a behavioural change in the future.
- Create more places where project team members can work together. Design these work places in such a way that it stimulates communication.
- Create a good system to share information with each other.

- Also use the window effect of simulation games during day two of the game. This means that an alternation of lectures and game-play should be applied, in which the lectures provide the windows for the participants to see what behaviour is desired.
- Shorten the presentations prior to the game or move certain presentations to another time to minimize the amount of information that is received by the participants. Make sure that during the presentations also the need for a behavioural change on the projects is mentioned instead of only the needed new structure.

The recommendations that are presented to Company X based on the abovementioned improvements and alternative solutions are described in Chapter 10.

Part IV

Discussion

This part starts with a conclusion in which an answer is given to the research question. Subsequently, recommendations are presented towards Company X which include possible improvements of the intervention and alternative solutions to create successful teamwork. The last chapter discusses the limitations of this research and provides the reader with a reflection on what different results could have been obtained if other or more possibilities would have been present.

Chapter 9 Conclusion

In this chapter, the answers to the sub-questions that were described in the conclusions of Chapter 5, Chapter 6 and Chapter 7 will be combined to define an answer to the research question of this research:

'Is a simulation game like Game X an effective tool to induce a behavioural change amongst employees of a construction company?'

According to the information from Chapter 2, Game X can be considered effective when, due to the simulation game, a shift in behaviour occurs from behaviour that obstructs successful teamwork towards behaviour that supports this. The game can be considered partly effective, when an increase in awareness of the need for a behavioural change amongst employees occurs, but a behavioural change stays away.

According to the conclusions of Chapter 5 and Chapter 6, no developments in behaviour on the projects occurred during the timespan of this research and it also seemed like most participants were still not aware of the need for a behavioural change on the projects after they played the game.

However, some developments were measured in the attitude of the participants. Participants became more aware of the importance of the behaviours that support the achievement of the success factor 'showing initiative' (looking forward, expressing ideas, doing proposals, responsibly taking risks). The participants especially became aware that the behaviour 'waiting' is shown too much on the projects and that they have to undertake initiatives themselves when successful teamwork is pursued.

Even though most participants determined initiatives to change the structure on the projects, which do not include a behavioural change, some participants determined initiatives to improve communication skills. These participants thus became aware of what they could do to change their behaviour within the success factor 'open communication'. This means that for some participants it did became clear what kind of behavioural change could be initiated by themselves.

According to the conclusion of Chapter 7, it can be assumed that the abovementioned developments in attitude were caused by the fact that the participants played Game X.

Based on this information, the answer to the research question of this research can be stated. Game X is not considered an effective tool to induce a behavioural change amongst employees of a construction company. This answer was given for two reasons:

- A behavioural change on the projects did not occur
- An increase of awareness of the need for a behavioural change only occurred amongst a part of the participants

However, the game did influence the awareness of the need for a behavioural change of this part of the participants and actions that should be undertaken to initiate this behavioural change it became clear to them. Therefore, for these participants the simulation game can be considered partly effective.

Next to this, there is a chance that a behavioural change was not measured yet, because changing behaviour can take a long time. The participants that became more aware of the need for a behavioural change, could convert this awareness into a real behavioural change on the projects in the future.

The fact that this research was too short to give a behavioural change enough time to develop forms a limitation to this research. This limitation is described and discussed in Chapter 11.

The answer to the research question of this research could be a start of filling the knowledge gap that exists around the application of a simulation game to induce a behavioural change in a construction company. This was the goal of this research. Furthermore, the information from this research and this answer to the research question could be used to state recommendations towards Company X to increase the effectiveness of their simulation game and intervention. These recommendations are stated in the next chapter.

Chapter 10 Recommendations

In the conclusion of this research it was established that Game X was not effective to initiate a behavioural change in a construction company. To increase this effectiveness or consider alternative solutions, recommendations have to be presented to Company X. During this research, information was gathered that could help to determine these recommendations.

First, recommendations should be presented that state improvements that could be made to Intervention Y to increase its effectiveness. These recommendations are described in the first paragraph of this chapter. Secondly, also recommendations should be presented that suggest alternative solutions to create successful teamwork. These alternative solutions are described in the second paragraph of this chapter. Lastly, during this research, questions arose that will have to be answered in the future. Therefore, recommendations for further research can also be stated. These recommendations are described in the third paragraph of this chapter.

The recommendations that were developed for Company X were validated by 'experts'. In this validation process, the term 'experts' refers to participants that experienced the game. You could call them so-called 'experts by experience'. The comments of these experts were incorporated in the recommendations that are stated below.

10.1 Improvements to the intervention

To increase the effectiveness of the intervention, already some improvements that could be made to the intervention were determined in the conclusion of Chapter 8. These improvements were based on the comments the participants had on the intervention. This section starts with describing the recommendations that include these improvements based on the comments from the participants. Next to this, the theoretical information from the literature study that was described in Chapter 2 also provides information that could be used to determine ways in which the simulation game could become more effective. The recommendations including these improvements based on theory are determined in the second section of this paragraph.

10.1.1 Improvements based on comments from participants

Improvement I

In the current version of the game, the window effect is only used during day one. This window effect is created by the short lectures that interrupt the game, during which a window is provided that shows and explains the new structure that has to be implemented on the projects. With the help of these windows, participants are able to determine what changes they have to make on the projects and what things they have to work on.

Company X is recommended to also make use of this window effect during day two. In using the alternation of interruptive lectures and game-play as is also used in day one, this window effect could arise during day two. The lectures should form windows in which the desired behaviours are explained. In these lectures the behaviours could be coupled to aspects of the structural change that has to be implemented on the projects. In this way the participants could see the need for these new behaviours.

Improvement II

In the current version of the intervention, the presentations prior to the game are considered to be too long and too much. This makes that too much information is received by the participants at once and that most information is not captured by them. Company X is recommended to shorten the presentations or to give certain presentations at another moment in time to minimize the information that is received by the participants at once.

Next to this, the presentations focus too much on the implementation of the new structure. Because the behavioural change that is pursued is not mentioned in these presentations, participants get the wrong idea that the only goal of the simulation game is to learn how to work with this new structure. When this behavioural change would be mentioned during the presentations prior to the game, it becomes clear to the participants that the implementation of the new structure has to be accompanied by a behavioural change. Together with the improvement that was described above, this would make clearer to participants what is expected from them during the intervention. As was explained in paragraph 8.2.1, when participants are more aware of what is expected from them, it is more easy for them to determine actions that really contribute to the goal of the intervention. This would make the game more effective.

10.1.2 Improvements based on theory

Improvement I

As it became clear from paragraph 8.2.1, it is not clear to participants what is expected from them in Intervention Y. A possible cause for this, could be the fact that the goals of the intervention are not SMART. The goal 'create behavioural change' does not make clear what behavioural change exactly is pursued. It is difficult for participants to define initiatives to improve their behaviour, if it is not clear what behaviour exactly should be changed. The theory from Chapter 2 could help to determine more SMART goals. In paragraph 2.4.1 different behaviours that support successful teamwork were defined. Company X is recommended to choose several behaviours from this list on which a behavioural change is most wanted. By stating the goal of the simulation game as 'a behavioural change on the behaviours…', it becomes clearer to participants what is expected from them. This makes it easier for them to determine initiatives to change this behaviour which would increase the effectivity of the simulation game.

This list of behaviours could also be used as a reference when the lectures that were mentioned in the improvements from the previous section are designed. By describing exact behaviours that have to change, the participants learn more about the new behaviour that is desired and are more aware of what exact behaviours to change during the game.

Improvement II

Also, another improvement could be determined based on theory. From the theory it became clear that in the dual-system theory, behaviour is influenced by both personal beliefs and environmental factors. It was established that when a combination of these two influences is used, a long-lasting behavioural change could be achieved (Figure 23 on the next page).
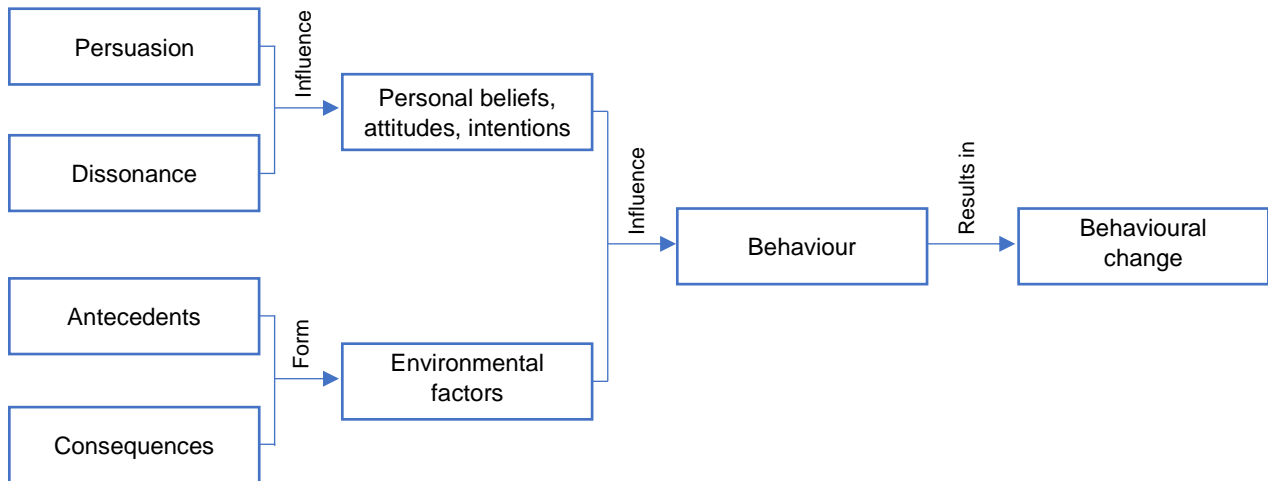
Figure 23. Combining changes in environment with an attitude change increases the chance of behavioural change

Simulation gaming influences personal beliefs by creating persuasion or dissonance. When the simulation game is effective, it creates enough persuasion or dissonance for the personal beliefs to change in such a way that eventually behavioural change is the result.

However, according to literature, the causal connection between a change in attitude and a change in behaviour appears to be weak. This means that behavioural change does not necessarily follow a change in attitude. However, when this change in attitude is accompanied by changes in the environment, both types of influences are used, which would increase the chance of behavioural change.

Company X is recommended to use this combination. By creating environmental factors that stimulate employees to change their behaviour, the changed attitude could lead to a real behavioural change. Environmental factors that could stimulate employees to change their behaviour could, for instance, be formed by:

- Monthly follow-up sessions after the game was played, like the coming-back session. During these sessions, the initiatives that employees wanted to undertake and the progress that is made will be discussed. During every session, the employees define new initiatives. First, it is most easy to carry out initiatives that are focused on implementing new structures on the projects, but as time goes by these initiatives all get carried out and new, more difficult initiatives have to be determined. The more often employees have attended such a session, the more their initiatives could start to include behavioural changes.
- Make the intended behaviour a part of the performance evaluation of employees. Once a year, every employee will have to undergo a performance evaluation. When the desired behaviours (as were mentioned in paragraph 2.4.1) are part of the criteria to which their performance will be measured, participants will feel more need to show these behaviours.

10.2 Alternative solutions

In the conclusion of Chapter 8 also already some alternative solutions were determined on the basis of information that was obtained from the participants. The recommendations including these alternative solutions are described in this paragraph.

Alternative solution I

According to the interviewees, a cause for the existence of obstructing behaviour on the projects is the structure of the projects of Organization Z. The projects of Organization Z are structured in such a way that all participating companies have their own financial goals and their own budgets. When, for instance, a certain alteration to the project would increase the total benefit but would be bad for the financial result of one company, these individual financial goals sometimes conflict with the joint project goals. In this way, this structure of the projects sometimes makes successful teamwork difficult.

With the solution of a 'shared wallet' there would be one budget for the entire project. This means that when the project gains, all companies gain and when the project loses, all companies loose. In this way the financial goals of the companies would not conflict anymore with the project goals which would make it easier to create successful teamwork.

Alternative solution II

A behavioural change does not happen overnight. This learning process takes time. Next to this, it takes time to make all employees of Organization Z play the game. The more employees that played the game, the more employees that could start undertaking initiatives and improve teamwork. These initiatives could encourage other employees to also undertake actions. When this ball starts rolling, there is a possibility that in the future more and more changes are made on the projects and the effectivity of the game increases. Therefore, Company X could be recommended to give it time and investigate the effectiveness of the game somewhere in the future (see recommendations for further research).

Alternative solution III

One of the causes for unsuccessful teamwork is the fact that project team members do often not know what team members from other companies are doing exactly. This causes misunderstandings, extra work and conflicts. When project team members from different companies have the opportunity to work together physically, communication is stimulated and project team members become more aware of what the others are doing. Therefore, Company X is recommended to create more places where project team members can work together and to design these work places in such a way that they stimulate communication. This can, for instance, be done by creating more open spaces instead of closed-off rooms and using desks behind which employees have to stand, this stimulates walking around and talking with each other.

Alternative solution IV

Another solution to make project team members more aware of what other team members are doing is a good system to share information with each other. When this system is in place, project team members are able to look up what others are doing and where certain information can be obtained. Company X is therefore recommended to develop a good and easy system that can be used on all different projects to share information with each other.

10.3 Recommendations for further research

During this research several questions arose that still need to be answered. In this paragraph, recommendations are stated that include the researches that should be conducted in the future to answer these questions.

Research I

As it became clear from 'alternative solution II' there is a possibility that in the future the effectivity of the game could increase because more people played it by that time. To investigate what happens if more people played the game, it is recommended to do further research into the topic of this empirical research in the future. The results of this research would be most reliable and valuable if it is conducted according to the theoretically best technical research design that was described in Chapter 3 of this research report.

Research II

As was determined in paragraph 2.3.3 the fact that a tailor-made simulation game could yield very different results in one company than in another, makes that one cannot assume that the results of this empirical research are representative for application of all games to all kinds of construction companies. To get a better insight in the real effects of gaming in the construction sector, the application of other games to other construction companies should be examined. The different games applied to different companies could be seen as different cases. In comparing these cases to each other, information can become clear about the real effects of simulation games on construction companies.

Chapter 11 Reflection

The nature of this research and the methods that were used, post some limitations on the results of this research. In this chapter, the content of these limitations and the impact they have on the results are described. The limitations that are posted on the results because of the nature of the research are discussed in the first paragraph of this chapter. The limitations that were posted on the results because of the methods that were used during this research are determined in the second paragraph.

11.1 Limitations posted by the nature of the research

The fact that this research is a graduation thesis research that has to be conducted within a certain time and by only one researcher posts some limitations to its results.

11.1.1 Time

The time-constraint is the first aspect of the nature of the research that puts limitations on the results of this research. As was determined in this research, behavioural change could take a while. This means that maybe a change in behaviour was not witnessed within the six-month time-constraint of this research, but could be witnessed when more time had been available. Therefore, the time-constraint could have produced incomplete results in this research.

Next to this, the time-constraint limited the number of interviews that were conducted after the game was played. This means that less data about the after situation was available, which made it more difficult to establish the existing behaviour on the projects after the game was played. Based on this small amount of data, it could only be established that the four interviewees did not experience a behavioural change on the projects. The time-constraint made that the assumption had to be done that this was really the case. This assumption had big impacts for the results of the research, as it determined the non-effectiveness of the game. By comparing the interview data to the quantitative action-list data it was tried to underpin the truthfulness of this assumption.

11.1.2 Number of researchers

Because this research had to be conducted by one researcher, some limitations were put on the results of this research. According to Chapter 3 the best way to establish the relation between the simulation game and a behavioural change was quantitative research. However, because this research had to be conducted by one researcher only, it was not possible to gather quantitative data from the interviews or observations as this would take too much time. This made that qualitative data was collected that was not necessarily representative for the other project teams. Because of the support of the questionnaire data, it was assumed that the interview data was representative for other projects. However, the fact that this had to be assumed means that it is possible that the results of this research are not entirely representative for other project teams.

11.1.3 Interview skills of the researcher

The third limitation of this research that limits its results is formed by the fact that the researcher was new to the interview method. As it became clear from theory on interviews, this could influence the data that was gathered via the interviews. The researcher could subconsciously lead the answers of the respondents in a certain direction by asking the questions in a certain way. The chance that this happens is bigger when the researcher is inexperienced in conducting interviews. This could have led to biased interview results. To prevent this, a lot of literature was examined about how to ask interview questions. Despite of this, there is a possibility that the results of this research are somewhat biased.

11.2 Limitations posted by used research methods

As was determined in Chapter 4 of this research report, some modifications had to be made to the theoretically best technical research approach. This means that some other research methods had to be applied. The fact that these other research methods had to be applied puts some limitations to the research results.

11.2.1 The interviews

The first limitation is formed by the fact that observations had to be replaced by interviews. The observation method would have been used to establish what kinds of behaviour were shown on the projects, but in this research, this had to be done with the help of interviews. Using an observation for this purpose would have produced more valid data, as this method of data gathering is better suited for gathering these kinds of data than an interview. During observation, the researcher can personally observe the behaviour, which means no moments of interpretation by other persons are involved. In an interview, this interpretation by other persons does occur, which makes this a less suitable method for gathering data about the existence of certain behaviour. In this research, this limitation made the validity of the results decrease.

11.2.2 The research units

The second limitation is formed by the fact that it was not possible to follow the developments within a group of employees, from the start of this research until the end of it. When this would have been possible, the real effects of the simulation game on a particular group could have been established. This would yield more valid results, as the course and effects of a simulation game could be different for every different group. In this research, findings from participants that played one game were combined with findings from participants that played another game. Despite the efforts to make the findings valid to other participants and game-runs, this characteristic of simulation games makes that the results would have been more valid if one or two groups had been followed from the start to the end.

11.2.3 The questionnaire

The third limitation of this research is formed by the fact that a questionnaire had to be used that was not specifically designed for this research. The fact that this questionnaire was designed for another purpose, makes the validity of this questionnaire already decrease. Even though useful information has been gathered with the help of this questionnaire, the validity of the results would have been higher when the questionnaire could have been designed specifically for this research.

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Appendices

Appendix A Success factors for teams

Clear goals

Having a clear goal and aiming at a concrete result, is what gives a team its meaning and identity. To be workable, goals have to be clearly formulated, realistic, measurable and meaningful. A clear goal helps the team members to determine what actions should be undertaken and what course has to be followed. For every action it should be considered if it would contribute something to the main goal of the team. It also helps in monitoring progress as the goal would eventually be the end result, so in this way progress in terms of how far the team is in achieving its main goal can be established. A clear goal helps in making decisions that all team members support. This makes it important that all team members support this main goal and feel owner of this goal. Every team member should feel responsible to act in the best interest of this main goal. This brings us to the next success factor.

Desired behaviour	Undesired behaviour
First think, then act	Starting something without thinking
Using a clear approach	Setting unclear goals
Evaluate, test	Giving no feedback
Stimulate to get better	Use hidden agendas

Joint responsibility

Joint responsibility means that every team member has influence on the decision making as well as on the end result. It increases the quality of the decision making and implies that everyone will be judged on the end result. If one team member fails, the whole team suffers as their entire end result is in danger. The influence that a team member has, is the only factor that makes sure that team members become really involved with the team goal. Joint responsibility means that team members cannot hide behind each other or blame others. Joint responsibility is therefore closely connected to loyalty. This sometimes is a problematic factor for employees that are put on a team for a short period of time from different companies, there could be a struggle to who's main goals to be loyal. This makes the characteristics of the main goal that were mentioned above (everyone can identify with the main goal and feels owner of the gaol) even more important.

Joint responsibility is something that does not come natural in the business world. In contrast, employees were rather asked to forget about responsibility, as they were rewarded if they had a dependent and passive attitude. Next to this, joint responsibility was never induced as it was up to employees to survive during reorganizations, for example. This causes selfishness and solism rather than adhering to team interests and team spirit. However, as part of a team you cannot win individually anymore: the team wins. This means that your interests are dependent on the team's interests. If everyone in the team lets go of a little bit of its own aims, real teamwork and togetherness may arise.

Desired behaviour	Undesired behaviour
Taking over tasks from someone else	Let the other person mess up
Wanting to do something for another	Drop others
Support each other	Being disinterested
Worry about the result	Blame someone else

Open communication

Communication is essential in a team. When people do not share what they are doing there is no possibility of working together. But even when people communicate within a team misunderstandings and incomprehension occur often. This leads to inefficiency, conflicts and distrust. To prevent misunderstandings and incomprehension and with this conflicts, open communication within the team is needed.

Open communication entails on the one hand effective communication. Effective communication means selecting information and distributing it to the right persons. For this, it is essential to know what other people do and which information they do and which they do not need. This in its turn, is only possible when team members communicate with each other and really show interest in what other people do.

This brings us to the second aspect of open communication. Open communication is about listening. With this, not just hearing what is been told is meant. Listening is about really paying attention to the ideas of the speaker, actively asking questions to be able to best understand his or her ideas and being open to these ideas by knowing that your interpretation may not be the only one.

Next to this, open communication has a lot to do with direct and honest communication. It is about being clear to each other about your own expectations, uncertainties, wishes and ideas. This builds trust between the team members. Is it also about feedback, about being able to be honest to each other what is done great and what can be done better. This brings us to the next success factor: mutual respect.

Desired behaviour	Undesired behaviour
Fully inform each other	Withholding information
Giving feedback	Not discussing problems
Giving your opinion	Being unclear and vague
Being honest	Gossip about other team members

Mutual respect

Respect starts with equality within the team. Every team member should feel able to criticize others, have a say in the decision making, insert ideas, etc. In short, every team member should feel appreciated, involved and listened to. Clear ranks and standings within the team would be counterproductive. Another aspect of respect is empathy. Team members should have empathy for other people's strengths and weaknesses, opinions and perceptions. Only when team members accept, respect and appreciate the differences between them, these differences can be used to augment the team's results. Expressing appreciation of one's actions or ideas is a way to express empathy for other people's strengths and weaknesses. Accepting team member's weaknesses is maybe the hardest part of this mutual respect factor. But as long as team members are involved and loyal and are committed to the team, they also have their 'right' to some weaknesses. These weaknesses therefore have to be tolerated and not alleviated. This has a close link to the 'not blaming' aspect within the joint responsibility factor. True respect then leads to an ambiance of trust and a basis for consensus.

Desired behaviour	Undesired behaviour
Listening to each other	Not listening to each other
Involve the others	Point out patsies
Being tolerant	Not taking others seriously
Express appreciation	Impose your own opinion

Flexible adjustment

A good team can adjust itself to the circumstances at any time. This means that a good team always keeps learning and developing. Knowledge is build and used by different team members and former experiences are used to develop further. Not only learning from former experiences, but also learning from each other increases flexibility. When people really know what other team members do and why they do this, they can take this into account when producing designs or other products. When different views on the products are already incorporated in the beginning they can be more flexibly adjusted to these other views.

Flexibility is also about long-term vision. When the team knows what lies ahead, it can adjust their products and designs to this. Close to this lies the importance of evaluation. It is important to learn from your mistakes to be able to do better in the future. Flexibility is about being willing to try new things and not staying stuck in certain methods or approaches. This learning vibe is something that is incorporated in the culture within the team. Flexibility and adaptability follow from this vibe and are also in the first place elements from the culture within the team.

Desired behaviour	Undesired behaviour
Learn from mistakes, evaluating	Making mistakes over and over again
Trying something new	Ridicule new things
Being curious	Always defending the old
Seeing the value of every idea	Only looking back

Showing initiative

This factor could be considered the most important factor. The team can have clear goals, joint responsibility, deal with each other in an open and respectful way and be flexible, if no action is undertaken the team is still not effective. A lot of people agree with the theory of teamwork and what it can bring and support this, but when it has to be brought to practise it is more difficult than one would think to really initiate a team that really is effective. Showing initiative means that team members do what they say, have an active instead of passive attitude and try to solve problems directly themselves instead of shifting them to someone else. They share their ideas, so something can be done with them and mostly see possibilities instead of barriers. This means that it should be rewarded when someone shows initiative instead of blaming him for the faults he maybe makes because of that. Of course, there are boundaries to appreciating initiatives, when taking the initiative leads to great losses because a lot of risk was involved with this it should maybe not get this much support. However, a certain culture has to be shaped that encourages looking forward and taking initiative.

Desired behaviour	Undesired behaviour
Looking forward	Waiting
Expressing ideas	Discourage others
Doing proposals	Focussing on barriers
Responsibly taking risks	Act recklessly

Appendix B Characteristics of quantitative and qualitative research

In this appendix the characteristics of quantitative and qualitative research that were stated in Table 10 in paragraph 3.1 are explained.

Quantitative research

According to literature, quantitative research focusses on establishing, confirming or validating whether or not a certain relationship exists. It does not answer 'how' or 'why' questions about this relationship. The power of this type of research lies in the large number of scores that illustrates the average. The goal of quantitative research is to generalise the relationships that were found between variables in a sample group, to a broader population (Hennink et al., 2011; Leedy & Ormrod, 2001).

To be able to generalise results, the sample group of quantitative research needs to be of an appropriately large size and the individuals within the sample need to be randomly picked. This to assure that the sample group represents all aspects of the broader population. Quantitative research comes down to assessing responses of a large number of people to a few variables, drawing conclusions from this and generalising these conclusions to a broader population (Creswell & Clark, 2011).

Because of the large sample size, it is not possible for the researcher to have a close relationship with all of the respondents. Quantitative research is, therefore, characterised by a more distant relationship between researcher and respondents. Furthermore, the large scale of quantitative research makes it necessary to define at forehand, into detail, which relationships should be measured between what variables. Otherwise, there is a chance that a big amount of useless information would be gathered. This means that a quantitative research often starts with a specific hypothesis. To create a better overview, quantitative researchers typically reduce the big amount of data to numbers. This makes it possible to summarize information from quantitative research through statistical analyses. (Hennink et al., 2011; Leedy & Ormrod, 2001).

In quantitative research, the researcher cannot say with certainty that an increase of one variable causes the increase of the other variable, as this relation could also be caused by a third variable that is not included in the research. This inability of quantitative research to produce causal relations forms a downside to the research type. Only when all other variables are controlled, like in a laboratory experiment, one could draw causal relations from quantitative research (Creswell & Clark, 2011).

Qualitative research

In contrast to quantitative research which aims at establishing whether or not a certain relationship exists, the emphasis within qualitative research lies on explaining and understanding these relationships. This makes qualitative research very suitable for answering 'why' or 'how' questions, in which it is about achieving depth of information (Hennink et al., 2011).

In qualitative research, the researcher gathers facts about every individual and puts all facts about all individuals in the sample together. From this information, a certain conclusion about the sample group can be drawn. The facts that are gathered contain in-depth information about the participants' points of view. This attention to individual points of view is underpinned by Leedy and Ormrod who state the purpose of qualitative research as 'describing and understanding the phenomena from the participants' points of view' (Leedy & Ormrod, 2001).

The in-depth nature of qualitative research is the opposite from the generalisability of quantitative research. This means that characteristics of qualitative research oppose those of quantitative research. For instance, in qualitative research, it is difficult to set a specific hypothesis. The conclusion of this kind of research is based on individual contributions of participants, which are difficult to guess. This makes that qualitative research often starts with rather general research questions instead of very specific hypotheses. These research questions are then specified during the research, when more and more information is gathered that impacts the research (Leedy & Ormrod, 2001).

It would practically not be possible to study a large sample group individually into great depth. This poses a practical constraint on qualitative research, which makes that the sample size of qualitative research needs to be small (Hennink et al., 2011). As a small sample group is used, the individuals in this sample group have to be selected carefully to pick the ones that can best shine light on the phenomenon under investigation (Leedy & Ormrod, 2001).

Viewpoints of participants are best obtained when asking open-ended questions (Fink, 2003a), which makes that data of qualitative research often is textual. These textual data are difficult to analyse statistically, but luckily this is not the purpose of qualitative research. To understand why or how certain relationships exist, the data from qualitative research are analysed interpretive. This means that the researcher interprets them to his or her views or experiences (Hennink et al., 2011).

In Table 10, the characteristics of quantitative and qualitative research are summarized.

Table 10. Characteristics of quantitative and qualitative research (Hennink et al., 2011)

	Quantitative research	Qualitative research
Objective	To quantify data and extrapolate results to a broader population	To gain a detailed understanding of underlying reasons, beliefs, motivations
Purpose	To measure, count, quantify a problem. How much? How often? What proportion?	To understand why? How? What is the process? What are the influences or contexts?
Data	Data are numbers or numerical	Data are words (called textual data)
Study population	Large sample size of representative cases Referred to as respondents or subjects	Small number of participants or interviewees, selected purposively (non-randomly) Referred to as participants or interviewees
Data collection methods	Population surveys, opinion polls, exit interviews	In-depth interviews, observation, group discussions
Analysis	Analysis is statistical	Analysis is interpretive
Outcome	To identify prevalence, averages and patterns in data. To generalise to a broader population.	To develop an initial understanding, to identify and explain behaviour, beliefs or actions

Appendix C Mixed methods research

The convergent parallel design

In a convergent parallel design, the quantitative and qualitative data collection and analysis are conducted in parallel. In principle these two researches are conducted independently and eventually the results are mixed during the interpretation to gain a more complete understanding of the topic at hand. It can also be used to validate quantitative measures. This research design is better fitted for researchers with limited time, that must collect both types of data in one visit to the field and that want to give equal value to the quantitative as well as the qualitative research. Because the design makes intuitive sense it is very suited for researchers new to the mixed methods theory and because the data are collected at the same phase in the research it is an efficient design. The draw backs of this design are that it costs a lot of effort to do all the researches simultaneously and to merge two sets of different data into one meaningful result (Creswell & Clark, 2011, pp. 77-81). A schematic representation of this design is shown in Figure 24.
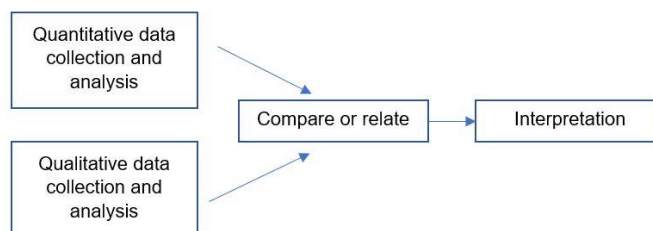
Figure 24. Schematic representation of the convergent parallel mixed-method approach

The explanatory sequential design

In an explanatory sequential design, the researcher starts with a quantitative research to answer the study's questions. Subsequently, in a second phase the findings from the first quantitative research are used to design a qualitative study. This second qualitative study is conducted to explain surprising findings from the first quantitative research. This design is most suited when the research problem is more quantitatively oriented and when the researcher has limited resources so conducting the different researches simultaneously is not possible.

For this research it is important that the researcher has the opportunity to get in contact with participants for a second round of qualitative research. Also, time is needed to conduct the two researches after each other. However, it is a straightforward and clear research design in which the connection between the two research approaches is clear. The advantage is that focused qualitative research can be done on the basis of the quantitative findings (Creswell & Clark, 2011, pp. 81-86). A schematic representation of this design is shown in Figure 25.
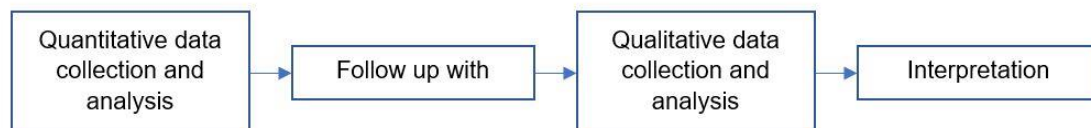
Figure 25. Schematic representation of the explanatory sequential mixed-method approach

The exploratory sequential design

An exploratory sequential design is almost the same as explanatory sequential design, but with the difference that the two types of research approaches are switched. In exploratory sequential design the researcher starts with qualitative research to answer the research's questions. Subsequently, a quantitative research is conducted to be able to generalize or test the findings of the qualitative research. This research design is more suited for researches that are more qualitatively oriented and in which it is not clear what relations and variables have to be studied. Due to the similarity between this design and the explanatory design, also in this design more time is needed and it is suited for researchers with limited resources. The advantage of this type of research is that qualitative research results can be made generalizable and therefore more accepted by quantitative-biased audiences (Creswell & Clark, 2011, pp. 86-90). A schematic representation of this design is shown in Figure 26.
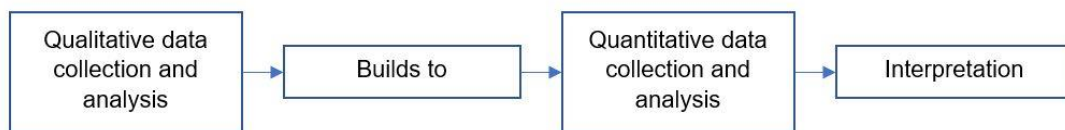
Figure 26. Schematic representation of the exploratory sequential mixed-methods approach

The embedded design

In an embedded design the researcher conducts both quantitative and qualitative research within a traditional quantitative or qualitative design. So, a qualitative way of data collection and analysis can be implemented within a quantitative design or vice versa. This approach is often used to test experimental trials. For instance, a qualitative research can be used to learn about a phenomenon about which an intervention has to be developed. On the basis of this information the intervention is conducted and with an embedded quantitative research, this intervention is tested amongst multiple participants (Creswell & Clark, 2011, pp. 91-96).
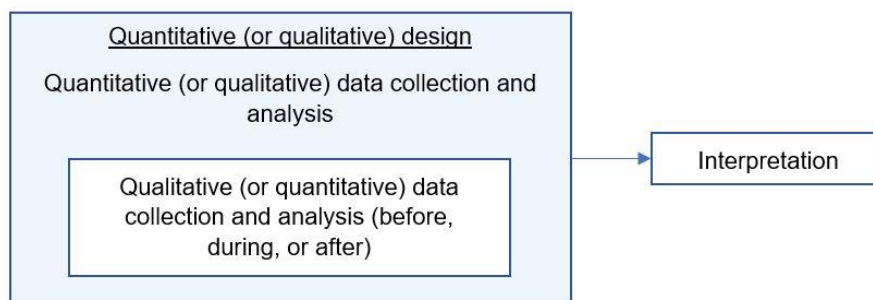
Figure 27. Schematic representation of the embedded mixed-methods approach

Appendix D Questionnaire design

A questionnaire is a series of written questions. The answers respondents give to these questions could help to define the situation at hand. The topic of the questions should become clear from the research objective of the research. The most applied questionnaire type is a self-administered questionnaire. This is a questionnaire that is handed out to a group of respondents who can complete the questionnaire on their own (Sommer & Sommer, 2002).

A questionnaire can exist out of open and closed-ended questions. Open-ended questions ask respondents to formulate their answers in their own words. In closed-ended questions, several options are given from which the respondents can choose their answer (Sommer & Sommer, 2002). Measuring behaviour can best be done with closed-ended questions. Measuring attitude can best be done with open-ended questions (Hennink et al., 2011).

According to Sommer & Sommer (2002) open-ended questions are used when:

- Not all possible answers to the questions are known to the researcher
- There are too much possible answers to a question, which would make a multiple-choice format too extensive
- The researcher does not want to suggest answers to the respondent
- The researcher wants the answers to be in the respondent's own words

They state that closed-ended questions are applied when:

- The number of respondents and questions is large
- A machine is used to score the answers
- The researcher wants to compare responses from different groups

It is recommended to use a combination of closed and open-ended questions in a questionnaire. The combination of the two types of questions can give a more profound insight in the issue and the two types of answers can validate each other (Sommer & Sommer, 2002). Next to this the combination of question types keeps the respondents involved throughout the entire questionnaire (Hennink et al., 2011).

It is best to start with the more general open-ended questions and end with the more specific closed-ended questions. When this would be done vice versa, the respondents would know what the intentions of the questionnaire are and could give biased answers to the more general questions. Next to this, the more general questions can help the respondents to ease into the subject and get used to the questions. Furthermore, it is important that all questions about a topic are grouped together, because otherwise respondents can get confused and could think the questionnaire is not thought through (Hennink et al., 2011).

When one askes for behaviour or attitudes it is recommended to start with questions about behaviour before one askes about attitudes. In this way respondents can first start to think about their behaviour (questions that are often easy to answer because they ask about facts and only require memory) and can subsequently explain this behaviour with their attitudes (Hennink et al., 2011).

To measure attitudes mostly the itemized rating scale is used. On a rating scale a range of evenly spaced points is provided which the respondent has to use to give his or her answer. It is important to balance these scales, so as much negative options to choose from as positive ones. Only when it is known that the responses will fiercely tend to be in one direction, the scales can be unbalanced (Hennink et al., 2011).

Most commonly used scales are five-point scales with two negative, one neutral and two positive answers. This because this scale is easy to understand and still makes sufficient discrimination between possible answers. Adding a middle category (the neutral option), however, will decrease the number expressing a clear opinion at one end or the other (Sommer & Sommer, 2002).

The neutral option can also be used by the interviewee as a 'don't know' response. It is therefore important to carefully word the neutral options, as so they cannot be used as a 'don't know' option and are only chosen when a respondent really has a neutral feeling about an issue (Hennink et al., 2011).

In a questionnaire one should make sure the questions are clear and meaningful to the respondents. This means that the use of difficult terms and words should be avoided. Questionnaire writers should be alert to not inserting biased questions to the questionnaire. Biased questions are questions in which the question is asked in such a way that it tends to ask for an answer in a certain direction. Bias can for instance occur when loaded terms and scare words are used. Sommer & Sommer (2002) give the following examples: 'Dangerous drugs' or 'excessive government'. Questions in which these phrases are used tend to ask for a more negative answer than when the words 'dangerous' and 'excessive' are not used.

Questions that are not asked neutrally are another form of bias. Sommer & Sommer (2002) give the following example: 'is the meat too salty?' This question tends towards a negative response. When one does need to ask questions like this, the questions could be made neutral again by following up with a question of the reverse implied bias. An example of this for the question about salty food could be 'is the meat properly seasoned?'

Analysing questionnaires should not take too much time, especially when only closed-ended questions are used. One could make an overview of how often the different answer-possibilities were used. This overview gives the general feeling of the respondents towards a specific question. The scores that the answer-possibilities of the different questions receive, can be compared to each other and conclusions can be drawn. These conclusions could then eventually help to answer the research question of the research the questionnaire was designed for (Sommer & Sommer, 2002).

Analysing open-ended questions takes a little bit more time. This analysis process starts with coding the answers, with which the process of sorting lengthy answers into specific response categories is meant. The response categories could be set in an inductive or deductive way. In an inductive way, the categories are made up of the data that was gathered. By reading through the data and looking for dominant themes, different categories can be determined.

In a deductive way, the surveyor preselects categories based on former knowledge, experience or literature study. The researcher subsequently combs through the data looking for data that falls into the preselected categories. When all answers are coded, the researcher could analyse this information by counting which categories or sub-categories are repeated most frequently and assess the data within these categories (Fink, 2003b).

A questionnaire is an economically interesting method for quantitative data gathering, as it does not take much time to distribute the questionnaires to a largely sized sample and to analyse closed-ended questions. Constructing the questionnaire would take most time. Because a questionnaire asks the exact same questions to all respondents, the results from the different questionnaires can be compared to each other. When the sample is taken randomly and is big enough, the findings from the questionnaire could be generalised to the wider population which makes the tool very suited for quantitative research.

Of course, there are some limitations to the application of a questionnaire. A questionnaire is subject to bias, as there is often no direct connection between the researcher and the respondent. The questionnaire could be filled in by someone else than the intended respondent, it could be filled in quick by the respondent without thinking, or a respondent could choose to answer not all questions. Also, what people say does not always match what they do or think. The possibility of dishonest answers and a false conclusion is present. Next to this, a questionnaire can only assess the general structure of a situation but not the details. This means that questionnaires are not suited to examine deeper levels of motivation or opinions about complex issues (Sommer & Sommer, 2002).

Appendix E Interview design

An interview is a conversation that involves at least two people. One person asks the questions, the other person responds. Interviews do not have to be face-to-face, they can also be held over the telephone or via video conference. Just as with a questionnaire, the questions that are asked during the interview are guided by the research question of the research during which the interview is conducted (Oishi, 2003).

Interviews can be structured, unstructured and semi-structured. Structured interviews are often used in quantitative research. In a structured interview the questions are formulated beforehand and asked in a set order an in a specified manner. This structure makes sure that the same interview is held with different people, which makes it suited for a quantitative study as the information from a number of interviews can be combined (Sommer & Sommer, 2002).

With an unstructured interview the researcher has a general topic in mind about which he or she wants to gather information. The researcher even might have specific questions he or she wants to ask, however, there is no specific order or wording of the questions. This makes that unstructured interviews often follow the respondent's answers and the interview is more like a natural conversation. The open nature of an unstructured interview makes it suited for gaining insights in a certain topic. It can be used to define areas of importance that might not have been thought of ahead of time and it allows the respondent to take the lead to a greater extent. The depth interview is a special form of the unstructured interview. The interview follows the respondent's answers and the researcher could choose to ask questions to go deeper into these answers to get a more profound insight into a certain issue (Sommer & Sommer, 2002).

In semi-structured interviews the same questions are asked to all respondents, but the order in which they are asked differs from interview to interview and sometimes even the way they are asked differs. A semi-structured interview is very suited when in-depth information has to be obtained and the interviewer therefore does not want to be restraint by a prescribed set of questions. However, he would like to have the advantage of being able to combine answers of different participants (Sommer & Sommer, 2002).

The unstructured and semi-structured interviews are more suited for qualitative studies. In qualitative studies the interview-questions often ask for a description of how phenomena are experienced rather than a measurement of aspects of experience. A qualitative oriented interview can address the 'why' and 'how' question and can investigate the nonquantifiable aspects of the respondent's experiences. This means that interviews are able to establish causal relationships between variables. In unstructured and semi-structured interviews less standardization is needed because the focus is usually on extracting great amounts of detail from a few respondents. Because of the large amount of data that can be gathered from one interview in a qualitative interview, the sample size for qualitative oriented interviews is often small(Oishi, 2003). On average, in qualitative research, a sample size within 12 and 30 respondents is sufficient to gather relevant and valid information (Rem, 2017).

Interviews can gather quantitative or qualitative data. When quantitative data is gathered, a large sample size is needed. This means that it would cost one researcher a lot of time to conduct all the interviews. Therefore, when quantitative information has to be gathered with the help of interviews, often a team of researchers conducts the interviews, or a researcher has people that help him or her to conduct the interviews. When qualitative data is gathered, fewer interviews have to be held and the interviews can be more in-depth. Qualitative data gathered from an interview could help in proposing hypotheses about unclear situations or issues.

Not enough knowledge is present to draw up a solid hypothesis for this issue or situation to conduct a quantitative research. Interviews are mostly used to gather qualitative data. On average, in qualitative research, a sample size between 12 and 30 respondents is sufficient to gather relevant and valid information (Rem, 2017).

The use of interviews can provide rich and fascinating research data, beliefs and opinions can be assessed as well as personality characteristics. Interviews can be used when the possibility of observation (which will be elaborated on below) is limited (Sommer & Sommer, 2002).

Analysing data from structured interviews is just like analysing a questionnaire, which was explained above. Analysing data from unstructured or semi-structured interviews often takes a lot more time. The data from these kinds of interviews often exists out of enormous amounts of textual information that must be summarized, analysed and interpreted. In principle, the process of analysing the data is the same as analysing data from open-ended questions in a questionnaire. The difference is formed by the fact that the data that were obtained from a questionnaire are already put on paper, whereas the data obtained from an interview first has to be transcribed into a clear form, for data analysis. Often this comes down to typing down what was said during the interview. After the data is put on paper the coding can start. This process was already explained in the section on questionnaires.

The difference with coding open-ended questions from a questionnaire and open-ended questions from an interview is formed by the fact that the amount of information in interview data is probably much bigger and, especially in unstructured interviews, the data is more scattered over the entire interview. Eventually, when all data is coded, comparisons could be made between codes and data within codes can be assessed (Fink, 2003b).

A big advantage of the interview method is the possibility for the respondents to formulate their stories in their own words. Another advantage of the method is formed by the fact that the interviewer is there to ask the questions. He or she can make sure that all questions that should be answered are answered, in the right order and by the person that has to answer them. In an interview the interviewer is also able to see the non-verbal reactions of the respondent to the questions (hesitation, nervousness, restlessness). Next to this, the interviewer can seek more information about half-answered questions and ask clarifications for respondent's answers. This could give a better insight into a certain issue (Sommer & Sommer, 2002).

Of course, also interviewing has its limitations. The first limitation was already pointed out in the section on questionnaires: what people say is not always what they do or think. An interview suffers a little bit less from this limitation, as in an interview also the non-verbal reactions of a respondent can be observed. These non-verbal reactions could tell a lot about how the person is feeling about his answer. The second limitation is formed by the fact that an interview is more open to bias than other methods. This bias is caused by the human interaction during the interview. Interviewers could unintentionally encourage or discourage the respondents to give certain answers by, for instance, posing the questions in a certain way or order (Sommer & Sommer, 2002).

Appendix F Conducting observations

During an observation the researcher observes actions and interactions between people in the study population. There is a range of different approaches to carry out an observation. At the one end of this range, the participant observation is located and on the other hand the non-participant observation. This range corresponds with the researcher completely participating in a culture or community, respectively with the researcher as a 'part of the wallpaper' observer, as invisible as possible. The selection of the approach that is used in a research should be based on the purpose of the observation. A participation observation is often used when a detailed understanding and description of a certain culture, ritual or practice is needed, whereas a non-participant observation can best be conducted when the behaviour of other people in certain situations needs to be measured (Hennink et al., 2011).

Different observation methods can be used. In a casual observation, there are no prearranged categories on which the observer tries to focus his attention. This method of observing is most useful in an early stage of the research when not a lot is known about the topic at hand. Systematic observation is done with a scoring system and prearranged categories. With help of an observation checklist, behaviour of the observed people is assessed according to these prearranged categories (Sommer & Sommer, 2002).

A casual or systematic observation is more fitted for a non-participant observation. In a participant-observation one should keep a journal of all things that happen and are interesting to the researcher. In this way, when the observation is over, the researcher can read back what happened and what these moments meant to him or her (Hennink et al., 2011)

Not only for a participant-observer, but also for other observers it is important to write down what is seen, heard, smelled and which actors were involved during an observation. However, taking so-called 'field notes' is not that easy. Because field notes will become the data for analysis of the observations, they have to be clear and detailed. Taking detailed notes also encompasses taking notes of things that do not seem important at the time, but that could become important later in the research. To be able to analyse the notes in the right way, it is essential to limit the field notes to what is really happening. This means that the researcher should not write down interpretations of what is seen. In his way, the notes can be analysed more objectively in comparison to each other. Eventually, the analysis of the field notes can be used to draw a conclusion about a certain topic, or to support or counter the results from another data gathering method (Hennink et al., 2011).

During an observation, a researcher has the chance to systematically observe and record people's behaviours, actions and interactions within their own socio-cultural context. This makes the observation method particularly suited for research in which people's actions have to be understood in context. The method can also be applied to provide findings of other research methods with a contextual understanding, or to complement other methods of data collection in another way. For instance, when questionnaires or interviews are conducted there is a possibility that dishonest answers were given to the questions. With observations in the field, the findings of the questionnaires or interviews could be verified and discrepancies between what people say and what people do can be identified (Hennink et al., 2011).

Observations can give a researcher more nuanced information than the methods in which information is just asked. In natural socio-cultural context, behaviour is more variable than it seems to be as a response to questionnaire items. This means that the results of natural observation can be unexpected and surprising (Sommer & Sommer, 2002).

During an observation, multiple things could be observed: actions and interactions of people, body language, places and settings. When all these aspects are observed simultaneously, a greater and deeper insight into the norms and values that surround the behaviour can be provided (Hennink et al., 2011).

When a researcher wants to understand people's behaviour within their own socio-cultural setting, this research should focus on the actions and interactions of the people in their own socio-cultural setting. When actions and interactions are observed a researcher should register:

- what people do (or do not do)
- what people say (or do not say)
- how people interact (or do not interact)

Also, body language can be observed. Body language can say a lot about the interplay of power or social control in a situation. Body language could for example reveal if people are interested or not or if they are shy or more daring (Hennink et al., 2011).

The third thing one could observe during an observation is the place or social setting. This is done to establish how people make use of a space. In these kinds of observations there is a bigger emphasis on characteristics of the space in the research questions. For instance, to establish whether or not certain places are accessible for people with disabilities.

However, also if the emphasis of the research lies on another aspect of the situation, the space can have a great influence on this other aspect. Therefore it is advisable to also observe the place in which the observation is done (Hennink et al., 2011).

During an observation, it is important for the researcher to be able to shift from a wide to a narrow perspective: after a specific interaction between two people is observed, the researcher has to be able to view the overall situation again. Next to this, the researcher should think carefully about his or her positionality (how his or her presence will influence what is observed), the place and time on which an observation is conducted and his or her appearance (clothing, make-up and jewellery) (Hennink et al., 2011).

This directly forms a disadvantage of the observation method, as a small error in choosing place or appearance can have a significant influence on what is observed during the observation (Leedy & Ormrod, 2001). Another disadvantage of the observation method is that it only deals with behaviour and not with attitude. According to Sommer & Sommer (2002) 'if you want to find out what people do, observe. If you want to find out what they think, ask them.' Observations are better to study natural behaviour, while opinions and beliefs can better be measured with the help of interviews and questionnaires.

Appendix G Applied questionnaire

As the questionnaire was conducted among Dutch speaking people, the questionnaire was designed in Dutch.

1= helemaal mee oneens	2= mee oneens	3= neutraal	4= mee eens	5= helemaal mee eens

Ik ben erg gemotiveerd om de reis naar 'Top in Projecten' mee te maken.	1	2	3	4	5
Ik heb elke dag de kans te doen waar ik goed in ben.	1	2	3	4	5
Ik heb in de afgelopen week waardering gekregen voor het werk dat ik gedaan heb.	1	2	3	4	5
Ik weet wat er van mij verwacht wordt als het om Top in Projecten gaat.	1	2	3	4	5
Als ik wat zeg dan wordt er goed geluisterd.	1	2	3	4	5
Ik merk in mijn dagelijks werk dat mijn leidinggevende integraal samenwerken steunt.	1	2	3	4	5
Ik voel me verantwoordelijk om goed werk (kwaliteit) te leveren.	1	2	3	4	5
Ik kan tegen mijn collega's in projecten alles zeggen wat ik kwijt wil.	1	2	3	4	5
Ik kan rekenen op de collega's waar ik in projecten mee samenwerk.	1	2	3	4	5
In de afgelopen zes maanden ben ik aangesproken op mijn gedrag.	1	2	3	4	5

1. Wat is voor jou het eerste en allerbelangrijkste punt om nu aan te pakken als het gaat om integraal samenwerken?

2. Wat is in jou werk het allerbeste voorbeeld van integraal samenwerken dat je het afgelopen jaar hebt gezien (op welk project en wat gebeurde er)?

3. Wat is in jou werk het slechtste voorbeeld van integraal samenwerken dat je het afgelopen jaar hebt gezien (op welk project en wat gebeurde er)?

Appendix H Action-list

As the action-lists were distributed among Dutch speaking people, the action-lists were designed in Dutch.

Appendix I Interview before the game

The interview is written in Dutch as it is conducted amongst Dutch people.

1. **Kunt u toelichten hoe u verbonden bent met de projecten van Organisatie Z?**
   - Werkt u op een specifiek project?
   - Houdt u zich meer achter de schermen binnen het bedrijf bezig?
   - Hoe is uw relatie dan met de projecten?
2. **Wat is het eerste wat u te binnen schiet als ik zeg 'samenwerking op de projecten van Organisatie Z'?**
   - Waarom?
   - Is dat positief of negatief?
3. **Wat denkt u dat de allerbelangrijkste voorwaarde is voor goede samenwerking?**
   - Waarom?
   - Is dat iets dat ook goed naar voren komt in de samenwerking binnen Organisatie Z?
   - Zo niet, hoe kan dat dan worden bevorderd?
4. **Heeft u het idee dat u de ruimte krijgt om dingen te veranderen?**
5. **Wat is volgens u de toegevoegde waarde van het feit dat Organisatie Z een organisatie is waarin alle bedrijven echt hun eigen bedrijf kunnen blijven, maar wel een samenwerkingsverhouding hebben?**
   - Heeft dit weerslag op de samenwerking?
   - Positief of negatief?
6. *Wat is het belangrijkste aspect van integrale samenwerking voor u?*
   - Wat hiervan gebeurt er nu al?
   - Wat zijn pluspunten op dit vlak van de samenwerking binnen Organisatie Z?
   - Als u het in één woord zou moeten omschrijven, hoe zou u dat doen?
7. **Integrale samenwerking gaat over begrip tussen verschillende actoren. Denkt u dat er voldoende begrip bestaat tussen medewerkers van verschillende bedrijven om integraal te kunnen gaan samenwerken?**
   - Waar gaat begrip volgens u over?
   - Wanneer is er voldoende begrip volgens u?
   - Hoe kan dit begrip vergroot worden?
8. **Integrale samenwerking gaat ook over communiceren. Wordt er voldoende gecommuniceerd tussen medewerkers van de verschillende bedrijven om integraal te kunnen gaan samenwerken?**
   - Is deze communicatie effectief?
   - Wordt er veel gecommuniceerd, maar wordt er niet geluisterd?
   - Zijn de gesprekken die gevoerd worden de juiste gesprekken?
   - Hoe kan dit worden verbeterd?
9. **Integraal samenwerken gaat ook heel erg over leren en verbeteren. Denkt u dat medewerkers op projecten genoeg open staan om van elkaar te leren binnen Organisatie Z?**
   - Gebeurt dit ook?
   - Hoe kan dit worden verbeterd?
10. **Integraal samenwerken is gebaseerd op vertrouwen. Denkt u dat u erop kunt vertrouwen dat anderen net zoveel moeite stoppen in een goed eindresultaat als uzelf?**
    - Wat houdt dat vertrouwen voor u in?
    - Waarom vertrouwt u anderen wel of niet?
    - Waar hangt dat vertrouwen van af?
    - Hoe zou dat beter kunnen worden volgens u?

11. Wat vindt u van Interventie Y?
- Waarom?
- Bent u tevreden over de stappen die al gemaakt zijn?
- Is het voor u duidelijk wat het doel van het project is?
- Is het voor u duidelijk hoe u daar uw steentje aan kan bijdragen?

12. Wat motiveert u om het doel van Interventie Y te bereiken?

13. Hoe denkt u dat nu deze theorie in praktijk moet worden gebracht?
- Wat is daarvoor nodig?
- Wat moet ervoor gaan zorgen dat mensen niet meer terugvallen in hun oude gedrag?

1. **Ben je in de afgelopen maand aangesproken op je gedrag? Dat kan positief en negatief zijn (je kan ook waardering hebben gekregen voor hoe je je gedraagt)**
   - Vind je dat dat genoeg gebeurt?
   - Is het moeilijk iemand aan te spreken op zijn gedrag?
   - Wordt er ook voldoende waardering uitgesproken?
   - Wordt men meer aangesproken sinds de game heeft plaatsgevonden? Dus is dit nu meer dan een half jaar geleden?

2. **Heb je je in de afgelopen maand verantwoordelijk gevoeld goed werk te leveren?**
   - Wat is goed werk dan? (Zegt hij dan eigen discipline of juist goed project?)
   - Voelen anderen zich ook zo? Waar voelen zij zich dan verantwoordelijk voor?
   - Heb je je ook weleens niet verantwoordelijk gevoeld goed werk te leveren?

3. **Heb je in de afgelopen maand het idee gehad dat er goed naar elkaar wordt geluisterd?**
   - Wordt er oprecht interesse getoond?
   - Werd er iets gedaan met wat gezegd was?
   - Moet dit beter?
   - Is dit al verbeterd?

4. **Word op de projecten waar jij werkt, gewerkt met gate reviews?**
   - Wat heeft dat gebracht?
   - Zo niet, zijn er wel duidelijke doelstellingen? Ook op de korter termijn?
   - Wat vond je van de gate reviews die zijn uitgelegd tijdens de game?
   - Wordt er gewerkt aan het stellen van duidelijke doelstellingen?

5. **Wordt de kennis van de verschillende disciplines op de projecten voldoende goed ingezet?**
   - Heb je een voorbeeld?
   - Vind je dat dat genoeg gebeurt? Dat men daar genoeg voor open staat? Dat ideeën een kans krijgen? Openstaan voor andere zienswijzen en daarvan leren.
   - Staat men daar meer open voor dan een half jaar geleden?
   - Zo niet, hoe komt dat? Valt er dan niets te leren of ben je een beetje afgesloten voor andermans ideeën en redenaties?

6. **Wat vond je van de game?**
   - Vond je het nuttig?
   - Vond je het leuk?

7. **Wat is blijven hangen van de game?**
   - Welke ontwikkelingen of inzichten?
   - Waarom heeft dat indruk gemaakt?

8. **Heb je de acties die je op je actielijst hebt opgeschreven uitgevoerd?**
   - Welke acties waren dit?
   - Was dat lastig? Waar liep je tegenaan?
   - Ben je er bewust mee bezig geweest of is het een beetje naar de achtergrond verdwenen?

9. **Wat wil je op dit moment aanpakken om integrale samenwerking op de projecten te bevorderen?**
   - Was dat ook iets dat je op je actielijst hebt gezet
   - Ben je daar nu mee bezig?

10. **Ben je op het moment concrete acties aan het ondernemen om integraal samenwerken te bevorderen?**
- Welke acties?
- Waarom?
- Is dit een verlenging van de actie op de actielijst?
- Waarom niet?

11. **Kom je veel mensen tegen die Game X ook gespeeld hebben?**

12. **Heb je het gevoel dat anderen zich aan het inzetten zijn om verandering teweeg te brengen?**
- Wat geeft je dat gevoel?
- Welke veranderingen?
- Is dat nu meer (sinds de game) dan daarvoor?

13. **Wil je nog iets kwijt over de game of Interventie Y?**

Appendix K Background information for existing behaviour

Clear goals

For this success factor especially, the code 'setting unclear goals' was assigned often. When the interviewees were talking about this behaviour, it had different implications. On the one hand, when the interviewees stated the existence of this behaviour, they meant that in the project teams often no goals were determined or decisions were made. They implied that there often was no strong foundation on the basis of which people knew what to do. Meetings were for instance often not ended with clear decisions and task divisions, which made that people not always knew what the short-term goal was.

On the other hand, when the interviewees talked about the fact that unclear goals were set, they meant that the decisions that were made and the goals that were set often were not SMART. This means that it is difficult to assess if they really are achieved. This also made it difficult for people to state short-term goals that would contribute to achieving these non-SMART goals.

The fact that the code 'giving no feedback' also was assigned regularly can be connected to this explanation. The behaviour 'giving no feedback' in this success factors means that progress in achieving set goals is not measured so no feedback is given to this progress. This can be connected to the abovementioned explanation of setting non-SMART goals because the progress of non-SMART goals is difficult to measure. This made that there was often no clear progress measurement and feedback to this progress.

The last code existing out of a behaviour that obstructs successful teamwork on the aspect of 'clear goals' that was assigned frequently is 'starting something without thinking'. The assignment of this code can be combined with the first explanation of the assignment of the code 'setting clear goals'. Often no clear decisions were made on the basis of which people knew what to do and how to act. This made that a lot of tasks were started without thinking them through.

The only behaviour that obstructs successful teamwork on the aspect 'clear goals', that was not mentioned a lot in the interviews is the code 'using hidden agendas'. This code includes behaviour in which other goals are pursued than team members actually tell each other. In the interviews explicitly came forward that this behaviour does not really exist on the project teams. This does not mean that people all have the same goal on a project.

On the contrary, the different companies that are represented in a team of Organization Z all have their own budget and financial goals, which always include earning as much money as possible with the project. Sometimes the goals of the different companies do not correspond with the goal of the project. This happens, for instance, when something that would ultimately yield more benefits on the total project, costs a certain company a lot of money. Then the financial goals of this company do not correspond with the goals of the project.

However, the fact that the code 'using hidden agendas' is not often used, is because people know from each other that different goals exist. The problem that does exist is that people do not share everything about these goals, because they do not want to or because they do not think it is important. This, however, has more to do with the success factor 'open communication', about which more will be told in one of the following sections. That the code 'use hidden agendas' is not applied often, does not mean everybody shares everything. It says something about the fact that people almost never lie about the goals they have for themselves. That a difference in company goals exists, is clear to everybody and this is something the employees of Organization Z learned to work with.

Joint responsibility

The code 'drop others' was assigned most often within this success factor. As was stated in Chapter 2 the success factor 'joint responsibility' is about showing behaviour that makes everybody in the project team feel equally responsible for the project's end result. This means that team members help and support each other to create the best end result for the project. However, when, as was explained in the previous section, the project's end result is at some moments less important than the financial end result for the individual companies, it sometimes happens that companies represented in the project teams stop supporting the project's end result and therefore also the other companies. For instance, when the project is starting to cost a certain company a lot of money, it will 'drop the others' and go for its own win. In this research, to this behaviour the code 'drop others' is assigned.

When the companies 'drop each other' according to the interviewees this could mean that the different team members stop paying attention to each other and let each other figure everything out by themselves. This can explain the number of times the codes 'let the other person mess up' and 'being disinterested' are assigned. However, the first code is assigned way less often than the second one. This because, in principle, team members are inclined to help each other, also team members that originate from other companies. However, this helping hand goes up till the point that the help starts costing the helping company too much. When this is the case every company will go for its own profits and stops helping.

However, for this success factor also some behaviours that support successful teamwork are mentioned. Not much though, but anyway more than were mentioned for the factor 'clear goals'. Especially the codes 'support each other' and 'worry about the results' have a somewhat higher score. In the text above already was explained why the first code was assigned fairly often. According to the interviewees, the somewhat frequent assignment of the second code had to do with a change in the way of working that already occurred. When this code was assigned to a section of the interviews, the interviewees often mentioned that this behaviour was somewhat newer and had to do with the fact that a new development had set in. A development based on the insights people obtained in the past, about the fact that the way of working at the time did not correspond with what had to be delivered. You could say that the program Intervention Y of Company X is an example of an extension to this development. The fact that more and more people worry about the project's result is a consequence of this development. According to the interviewees, the situation now is already 10 times better than it was 10 years ago.

The fact that supporting behaviour was mentioned because already a development had set in, was a hypothesis that was created and mentioned in paragraph one. In this section, this hypothesis is confirmed for this success factor.

Open communication

The behaviour that obstructs the achievement of this success factor that was mentioned most often is 'being unclear and vague'. When the interviewees mentioned the existence of this behaviour, they stated that in general little is shared. Team members are often vague and unclear about their expectations, their interests and their activities. This was already mentioned when explaining the low score on the code 'use hidden agenda's'.

The other codes that scored high on this success factor were 'not discussing problems' and 'withholding information'. The fact that little is discussed has its impact on the degree to which problems are discussed. As people are not used to share their problems, it is also difficult to discuss them.

The high score on the code 'withholding information' has to do with the fact that different companies often do not want to show all the (mostly financial) information they have to other companies that are represented in the project team. This does not mean hidden agendas are present, but the people are just cautious as to what information they do and do not share. It could be difficult to receive money from some other company within the project, when this other company knows you are doing financially very well, whereas they themselves are struggling because the project costs them too much. This will always be an issue if you work with different companies that have their own budget.

On the other hand, also behaviour that supports the achievement of this factor is shown. Not as much as the obstructing behaviour, but anyway more than the supporting behaviours within the success factor 'clear goals'. The two supporting behaviours that receive the best scores within this success factor are 'fully inform each other' and 'being honest'.

This contradicts the fact that also a high score was given to the code 'withholding information'. The interviewees explained this by stating that the supporting behaviour is actually often only showed when a project has hit rock bottom, when none of the companies involved is making profits out of the project anymore and the result of the project is in danger. At those moments the team members see the importance of expressing these behaviours that support successful teamwork. For this factor the high score for some supporting behaviours does thus not mean that on the behaviours of this success factor a positive development already had set in, as was the case for the behaviours of the factor 'joint responsibility' and which was hypothesised in the first paragraph of this chapter on quantitative information.

Mutual respect

The behaviour that obstructs the achievement of this aspect that is mentioned the most is 'not taking others seriously'. In the interviews came forward that this behaviour had to do with the fact that there is little understanding between the different team members, especially between team members of different companies. This has to do with the fact that, as was established above, too little is shared amongst team members, which has as a result that team members do not understand each other's viewpoints and therefore do not take them seriously. From the interviews it became clear that this formed a sort of viscous circle. The fear of not been taken seriously, namely again made that team members did not dare to share issues, problems and interests.

It is interesting to see that only one behaviour that supports the achievement of this success factor is mentioned (and quite often also). This behaviour is 'being tolerant'. From the interviews it explicitly became clear that the other supporting behaviours in this success factors are not shown on the projects.

Interviewees point out that project team members find it very difficult to listen to each other (which means, doing something with what is told) and express appreciation. According to the interviewees, the latter is almost never done. Also involving others is difficult, which again has to do with the fact that so little information is shared. When people are used to keeping information to themselves, it directly becomes difficult to involve others in your tasks and problems.

The fact that the behaviour 'being tolerant' was assigned quite often, has the same reason as why the behaviour 'support each other' in the success factor 'joint responsibility' was assigned some times. Up until the point that it does not cost a company too much, they want to support others and be tolerant towards their viewpoints and issues. However, from the moment that it starts to become difficult for the companies to achieve their own financial goals, they will drop the others and stop being tolerant towards each other's viewpoints and issues.

Flexible adjustment

On this success factor the behaviours that support the achievement of this success factor are mentioned almost equally often as the behaviours that obstruct this achievement. In the previous paragraph a possible reason for this was determined. It was hypothesised that this almost equal score could be due to an already set-in development that causes that more and more supporting behaviour is shown on the projects. This explanation was already confirmed for the score on the behaviours that support the achievement of the success factor 'joint responsibility'.

According to the interviewees this is indeed the case. Especially the behaviour 'learn from mistakes, evaluating' starts to exist more and more on the projects. Because years ago, people became aware of the fact that the way of working on the projects was not able to satisfy the demands of the clients anymore, already a change had set in. This change mostly included the development of the insight that the different disciplines in the construction sector need each other more. Knowledge should be shared and captured more so others could also use it. This made that in the past years and now still, more and more systems are developed that could help in capturing knowledge and share this knowledge with others. The behaviour 'learning from each other' has to do with this.

However, one cannot ignore the fact that also the behaviour 'making mistakes over and over again' is mentioned a lot. 'Making mistakes over and over again' is related to the fact that the interviewees all agree that within Organization Z nowadays, almost nothing is learned from other projects or people. This has to do with the disinterest that was mentioned under the success factor 'joint responsibility' and with the fact that people in general do not try to understand each other as was stated above. Next to this there are also no systems in place that make it possible to easily learn from each other or from other projects. However, a lot of initiatives for the development of these systems are undertaken. This is the reason why also the code 'learn from mistakes, evaluating' has a high score. Nowadays not much is learned from each other or from other projects, but a lot of initiatives are undertaken to make this possible.

The earlier mentioned development is illustrated by this, because both positive and negative behaviours are shown. The development is still going on and not all obstructing behaviour already has been replaced by supporting behaviour.

This means not all people are already learning from their mistakes and from others. The design of the different systems that can help to support this is a sign that supporting behaviour is on its way.

The lively development of new initiatives is also reflected in the facts that the codes 'trying something new', 'being curious' and 'seeing the value of every idea' are assigned and that the code 'ridicule new things' is never assigned.

However, because change is difficult and it is easy to fall back into old behaviour, the codes 'looking back' and 'always defending the old' are also assigned sometimes.

Showing initiative

This is the only success factor about which more behaviour that supports the achievement of this factor is mentioned than obstructing behaviour. However, also obstructing behaviour is mentioned pretty often. For the scores on behaviour that obstructs the achievement of this success factor and behaviour that supports this achievement, the same goes as for the obstructing and supporting behaviours of the success factor 'flexible adjustment'.

The scores on both supporting and obstructing behaviours are almost equally high. Not as equal as the scores on the behaviours in the success factor 'flexible adjustment', but they lie relatively close.

According to the information in the interviews, this can also be explained with help of the development that already set in. The insight that was created in the past, about the fact that something had to change in the way of working to match it to the client's demands, made that from that moment onwards already initiatives were undertaken to improve the way of working. According to the interviews, they still are undertaking initiatives, like the development of systems to share information as was discussed in the previous section on 'flexible adjustment'.

However, as was stated in the introduction of this research, the construction sector is a conservative sector which finds it hard to change, so of course also behaviours that obstruct the achievement of this success factor are shown. The behaviour that receives the highest score is 'waiting'. With this behaviour is meant that people do not undertake actions themselves to improve the situation. However, the high scores on the supporting behaviours 'expressing ideas' and 'doing proposals' say that people do come with new ideas. The combination of these two behaviours could result in a situation in which people know what has to change, have ideas about how this has to be done, but these suggestions are not concrete enough which makes that it is difficult to really undertake actions upon these ideas and proposals. With help of the following information in this paragraph on reasons behind this behaviour and solutions that were suggested by interviewees to improve the situation, this hypothesis could be investigated.

Appendix L Behaviours mentioned in type 1 'before' interviews

Clear goals

	Support				Obstruct			
	First think, than act	Using a clear approach	Evaluate, test	Stimulate to get better	Starting something without thinking	Setting unclear goals	Giving no feedback	Use hidden agendas
Interview 1	0	1	0	2	2	2	5	0
Interview 2	0	0	0	0	0	0	0	0
Interview 3	0	0	0	0	6	15	5	0
Interview 4	0	0	0	0	4	1	1	0
Interview 5	0	0	0	0	0	2	0	0
Interview 6	0	1	0	0	0	2	0	0
Interview 7	0	0	0	0	0	1	0	1
Interview 8	1	1	0	0	0	1	0	0
Interview 9	0	0	0	0	0	0	0	0
Totals	1	3	0	2	12	24	11	1

Joint responsibility

	Support				Obstruct			
	Taking over tasks from someone else	Wanting to do something for another	Support each other	Worry about the result	Let the other person mess up	Drop others	Being disinterested	Blame someone else
Interview 1	0	0	0	1	1	3	3	0
Interview 2	0	0	0	1	0	0	0	0
Interview 3	0	0	0	1	1	2	1	3
Interview 4	0	0	0	0	1	5	2	2
Interview 5	0	2	0	0	0	5	1	0
Interview 6	0	0	0	0	0	1	0	0
Interview 7	0	0	4	4	3	2	5	1
Interview 8	0	0	0	0	0	3	1	3
Interview 9	1	1	1	1	2	5	3	0
Totals	1	3	5	8	8	26	16	9

Open communication

	Support				Obstruct			
	Fully inform each other	Giving feedback	Giving your opinion	Being honest	Withholding information	Not discussing problems	Being unclear and vague	Gossip about other team members
Interview 1	1	0	0	0	0	1	1	0
Interview 2	0	0	0	1	4	3	3	0
Interview 3	0	0	0	0	3	5	14	0
Interview 4	0	0	0	0	1	1	1	0
Interview 5	1	1	1	0	5	4	9	0
Interview 6	0	0	0	0	2	1	1	0
Interview 7	6	0	0	5	4	0	0	0
Interview 8	0	0	0	0	1	1	1	0
Interview 9	2	0	0	1	1	0	1	0
Totals	10	1	1	7	21	16	31	0

Mutual respect

	Support				Obstruct			
	Listening to each other	Involve the others	Being tolerant	Express appreciation	Not listening to each other	Point out patsies	Not taking others seriously	Impose your own opinion
Interview 1	0	0	0	0	1	0	0	1
Interview 2	0	0	1	0	1	0	1	1
Interview 3	0	0	1	0	0	1	5	0
Interview 4	0	0	0	0	0	0	2	0
Interview 5	0	0	1	0	2	1	3	0
Interview 6	0	0	0	0	0	0	2	0
Interview 7	0	0	2	0	0	0	1	0
Interview 8	0	0	1	0	0	0	1	0
Interview 9	0	0	3	0	1	2	4	0
Totals	0	0	9	0	5	4	19	2

Flexible adjustment

	Support				Obstruct			
	Learn from mistakes, evaluating	Trying something new	Being curious	Seeing the value of every idea	Making mistakes over and over again	Ridicule new things	Always defending the old	Only looking back
Interview 1	0	0	0	0	1	0	0	0
Interview 2	2	3	2	4	1	0	0	0
Interview 3	0	0	0	0	5	0	5	3
Interview 4	3	0	2	0	4	0	0	0
Interview 5	2	1	1	0	3	0	1	0
Interview 6	5	1	0	0	3	0	0	0
Interview 7	2	0	0	0	2	0	1	0
Interview 8	3	1	0	0	1	0	0	1
Interview 9	2	0	0	0	3	0	1	0
Totals	19	6	5	4	23	0	8	4

Showing initiative

	Support				Obstruct			
	Looking forward	Expressing ideas	Doing proposals	Responsibly taking risks	Waiting	Discourage others	Focussing on barriers	Act recklessly
Interview 1	3	0	0	0	0	0	0	0
Interview 2	0	6	5	0	1	0	2	0
Interview 3	0	0	0	0	0	0	0	0
Interview 4	0	1	0	0	5	2	2	0
Interview 5	3	0	0	0	3	0	1	0
Interview 6	0	0	0	0	1	0	0	0
Interview 7	0	0	0	0	0	0	0	0
Interview 8	1	3	1	0	0	0	0	0
Interview 9	0	0	0	0	0	0	0	0
Totals	7	9	6	0	10	2	5	0

Clear goals

Making clearer what people's tasks are	8
Making clear decisions on how changes are handled	2
Making clear appointments	7
Establishing what is integral teamwork	9
Clear, straight approach	9
Clear joint goal	7

Joint responsibility

See importance of integral teamwork	8
More working towards a joint interest/ towards the projects best interests	37
More joint focus on quality and maintenance	1
More involvement of people in setting joint goals	5
Financial support from discipline to discipline	8

Open communication

Showing interest in each other	8
Share more (interests, expectations, remarks)	33
Really doing something with what is said	2
Distributing the right information to the right persons	3
Being honest	10

Flexible adjustment

Thinking on the long-term	2
Making clear where knowledge can be found	3
Learning from each other and using each other's knowledge	29
Being able to flexibly assign people to projects	1

Mutual respect

Using qualities of employees	9
Understanding each other's interests	12
More social safety in the teams to be able to say what you need	7
Increase trust	12
Different team members are evenly important	3

Showing initiative

Showing initiative	3

Appendix N Initiatives defined on action-lists

Initiative	Value
Including realisation contractor in design	5
Being more transparant	1
Using the 'teamversneller'	3
Making the structure of the team more integral	4
Implementing projectapproach using V-model and gate reviews on projects	34
Also emphasize positive points	1
More attention for start of the project	8
Seach the right role for me within the project team	2
Confronting people with their behaviour	11
Showing more interest in other project team members	1
Communicate more (frustrations, interests, opinions, expectations)	4
Being more involved in the projects	11
More communicating about relation instead of contents	2
Introducing 'managementdrives' when forming teams	5
Learn from the past	1
Vulnarable attitude	3
Involving client in process	2
Critisising integrality of current project	2
Giving a good example	1
Loosing fear to make mistakes	4
Help each other more	1
Really applying what was learned, just doing it!	14
Clear division of tasks	1
Clear ambitions	2
Controling execution of decisions	1
Thinking outside own interests	2
Listen better	4
Better signalising 'weak signals'	1
Creating better overview of documents	2
Right people on the right place	2
Propagate the importance of integral teamwork	15