MASTER THESIS REPORT

THE CULTURE DRIVEN GAME DESIGN METHOD

ADAPTING SERIOUS GAMES TO THE PLAYERS' CULTURE

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OCTOBER 22, 2010

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PREFACE

This report contains the end result of my Master Thesis project conducted at the Centre for Study of Science, Technology and Policy (STEP) located in Bangalore, India. CSTEP is a private, non-profit organization with a vision to undertake research in engineering, science, and technology where it is relevant to India's economic and human development. This project was the final step in acquiring the MSc. Grade in Systems Engineering, Policy Analysis and Management from the faculty of Technology, Policy and Management at the Delft University of Technology.

During this project I was challenged in many fields; my enthusiasm for gaming, my skills in conducting a scientific research project and my ability to conduct such a project in ´incredible India´. Looking back I am very satisfied with the results. The enthusiasm for gaming survived the project as I am still eager to hit the ground running with Be Involved, my start-up company in educational games. This enthusiasm got boosted when Eswaran Subrahmanian stated that CSTEP started working on the second version of the Indian Electricity Game designed in this research, aimed at taking it to the Ministry of Power. Also the scientific result of this research was very satisfying, as part of this research will be published as a book chapter in *Integrating Cultures: Formal Models and Agent-Based Simulations*. The third challenge of this project, conducting my graduation project in India, can eventually be called a success. I turned out that getting into India was the hardest part.

However, these results would not have been possible without the support of many. I would like to thank my first supervisor Rens Kortmann for his dedicated support during the project. Rens was enthusiastic from the minute I walked into his office to ask him to be my supervisor for my graduation project on game design. Although he missed the whole fun part of designing the game he remained genuinely interested and supportive throughout the project. Every meeting with Rens provided me with valuable insight or renewed energy to proceed in this research.

Furthermore I would like to thank Sebastiaan Meijer, my second supervisor, for his straight forward critique and the backstage ticket into the world named culture. I also thank Alexander Verbreack for introducing me to CSTEP and thereby providing me with the opportunity to conduct this project.

Last but not least I want to thank my ´main sponsors´. Mom and dad, thank you for providing me the opportunity to finish this study. Above all thank you for the support in the past years I spend in Delft.

And of course thanks to all those other people who supported me during this research.

Kees Meershoek

Delft, October 2010.

EXECUTIVE SUMMARY

Serious games are an important tool in creating, explaining, building, deploying and evaluating solutions for complex multi-actor problems. The Indian electricity challenge is such a complex multi-actor problem which forms the content of the Indian Electricity Game. To become a success it is necessary that serious games, like the Indian Electricity Game, are adjusted to the culture of its players. By playtesting with the targeted players, game designers are able to adjust their serious games to the culture of the targeted players. However, due to a lack of time, high costs and the need for a good first impression, playtesting is not always possible. This problem statement led to the following main research question:

What method is able to adapt serious games to the culture of the players without playtesting them with these players?

In an answer to this main research question, this research proposes the culture driven game design method. This method consists of the culture driven game design iteration which is embedded in the iterative Triadic Game Design development model. The iteration, as depicted in figure 1, consists of three steps. In step 1 the culture difference between the playtesters and the targeted players is assessed using a questionnaire. In step 2 the assessed culture difference is translated to a set of potential conflicting game elements. In step 3 the relevance of the conflicting game elements is determined. When the relevant conflicting game elements are mitigated in the proceeding design step, the game is adapted to the culture of the players.

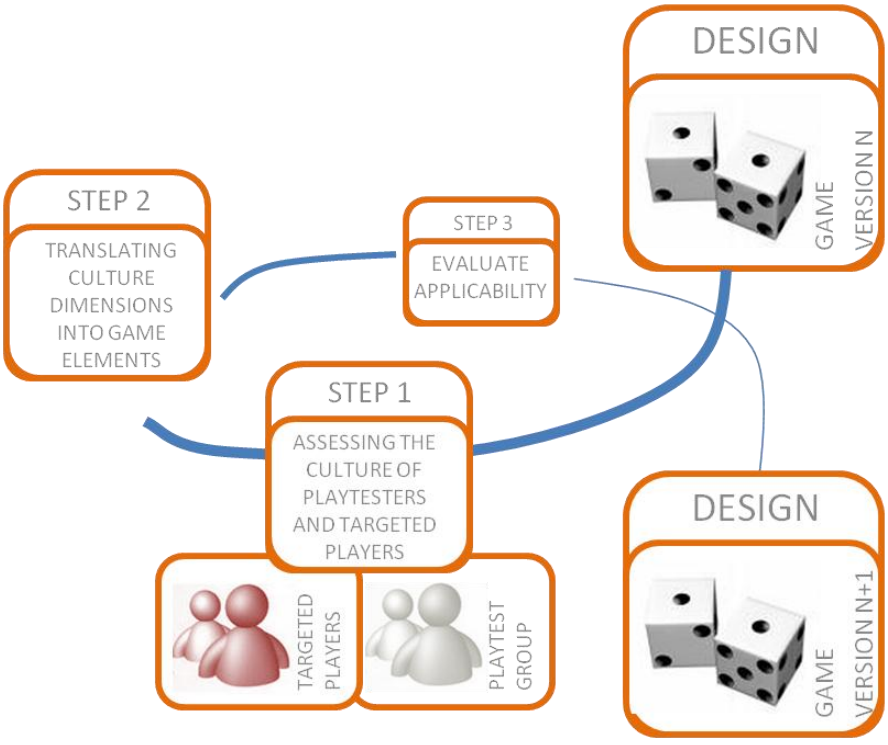

Figure 1 – The culture driven game design iteration

The culture driven game design method was evaluated by means of two case studies and an expert interview. In these case studies the Indian Electricity Game was used that was developed during this research at the Centre for Study of Science, Technology and Policy (CSTEP) in Bangalore. It was concluded that the culture driven game design method was able to adapt the Indian Electricity Game to multiple groups of players with a different culture without playtesting the game with these players. However, further research is needed to evaluate if the method is also applicable to other types of serious games and other types of cultures.

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TERMINOLOGY AND ABBREVIATIONS

In this chapter the terms and abbreviations are explained that were used throughout this report.

Terms

The three terms that are discussed in this chapter demarcate the starting point of this thesis. With the presented knowledge the readers without a background in serious gaming or cultural science are able to understand the content of this study.

Serious games

We all know games as entertaining settings with rules in which the players need to complete objectives to win the game. Serious games are not intended to be played primarily for amusement. Serious games have an explicit and carefully thought-out educational purpose (Abt, 1970). Since the 1970's serious gaming gained acceptance and has become one of the prime ways of learning to prepare for complex organizational situations in a realistic context (G. J. Hofstede, 2008). Several reasons for this are that serious games offer us a rich field of risk free, active exploration of serious intellectual and social problems (Abt, 1970).

In the past decades serious games have been applied in public policy, business, management and a host of other disciplines (Duke & Geurts, 2004). Within these disciplines games became a very powerful tool to involve and stimulate people (Buis, 2008). Several advantages are specifically linked to serious gaming. "Memories from games have proven to be vivid after 25 years" (Duke & Geurts, 2004, pg. 285). Another advantage is the superior motivation of participants in educational simulation games (Abt, 1970).

As in every developing field of science the terminology is heavily discussed (see for an overview: (Susi, Johannesson, & Backlund, 2007). But it is not in the interest of this thesis to engage in this discussion. The choice has therefore been made to follow Harteveld in his argument and use *serious games* as the term for the type of games referred to in this thesis (Harteveld, 2010).

Culture

As the title suggests, this report describes a method to adjust serious games to the culture of its players. Since the term *culture* has over 150 definitions (Kroeber, Kluckhohn, Untereiner, & Meyer, 1952), the definition and notion of culture used in this report will be stated here. A more elaborate discussion on culture can be found in section 1.2.

This report works with the definition of culture that comes from Hofstede and Hofstede who define culture as "the collective programming of the mind that distinguishes the members of one group or category of people from others" (Hofstede & Hofstede, 2005). An important aspect of this definition is the granularity of *one group or category of people.* Following the definition, *a group or category of people* can be of any size. In the context of this report this *group or category of people* is a group of players which in the majority of serious games consists of 2 to 20 people. This notion of the size of the group of people a culture applies to may differ from the more general notion where culture applies to a large, geographical defined group of people.

Objectives of the game

There is a vast difference between the objectives of the game and the objectives in the game. *Objectives in a game* are created by the designer of the game and represent the goals for a participant within the game. Examples are acquiring the most money, saving the princess or balancing economic wealth and environmental impact. *Objectives of the game* are set by the owner of the game and represent the reasons why participants should play the game. It is the raison-de-être of the game. Examples are learning about the consequences of first generation bio-fuels or brainstorming about new company strategies.

Some authors use learning objectives instead of objectives of the game like (Harteveld, 2010) and (Fullerton, 2009). In this thesis the term objectives of the game will be used since learning covers only a part of the objectives a game may have next to creating consensus, improving communication and facilitating a creative process (Duke & Geurts, 2004).

Abbreviations

The following abbreviations are used throughout the report.

CAQ	Culture Assessment Questionnaire
CEA	Central Electricity Authority
CSTEP	Centre for Study of Science, Technology and Policy
IEG	Indian Electricity Game
MNRE	Ministry of New and Renewable Energy
MW	MegaWatt
Rs	Rupees, Indian currency
SGD	Serious Game Design
TGDdm	Triadic Game Design development model
TU Delft	Delft University of Technology

CHAPTER 1 - INTRODUCTION

In this first chapter the reasons for this research are stated in the problem introduction in section 1.1. In the next section the theoretical basis of this research is described and the research is demarcated. Based on the problem statement and the research demarcation, the research questions are formulated in section 1.3. Section 1.4 presents the research method and instruments used to answer these questions. This chapter ends with readers guide for this report.

1.1 Problem introduction

Serious gaming is an important tool in creating, explaining, building, deploying and evaluating solutions for complex multi-actor problems (Abt, 1970; Duke, 1974; Duke & Geurts, 2004; Klabbers, 2008; Mayer, 2009; Mayer & Veeneman, 2002). Serious gaming provides the opportunity to interact with complex models and experience (r)evolutionary changes (Mayer, 2008). By doing this in a game, solutions can be implemented and tested without damaging the real world (Abt, 1970). This is a great benefit in a context of complex multi-actor problems (Mayer, 2008). In this process of interaction, the players of serious games will always bring their own culture into the game (Consalvo, 2009; Fine, 1983). Practice showed that if the game is not aligned with the culture of the players, this can result in conflicting behaviour that refrains the players from reaching the objectives of the game. The following examples visualize the possible effect of culture in serious games.

AN EXAMPLE OF THE EFFECT OF CULTURE IN SERIOUS GAMES

Months of careful and expensive preparation were put in the Indian Electricity Game. That morning this serious game would be played by the board of the national Planning Commission. Good results in this session would mean a leap forward in the funding of the future activities of Indian think tank CSTEP. In the introduction of the game the facilitator explained that the players had 20 minutes for the first assignment. The players needed to construct the planning for the additional electricity generation capacity for the coming five years. At that moment two of the board members stood up and refused to play. They claimed it was a disgrace to summarize the complex and delicate planning process executed by the numerous employees of the Planning Commission in a 20 minute assignment.

This fictional situation would be a nightmare scenario for CSTEP, however talking to other serious game designers teaches that this scenario is not unique. A classic example is the supply chain game that was set up for a full afternoon of gameplay by a company department in Germany. Challenges in supply chain management arise due to a lack of information availability throughout the chain. The game was made to let the participants experience the consequences of this information scarcity. Despite the extensive preparation, the game was finished in less than 5 minutes after the department boss summoned each player to provide all the information available in the game to him. (Harteveld, 2009)

Another example involves a trading game designed at an American university. When this game was played with American students it did not last long. The opportunity to let other players go bankrupt was immediately interpreted as the objective in the game. When the game was played with exchange students from Taiwan it took hours and hours before the game was eventually aborted. At the time the game was ended, none of the players had gone bankrupt. The opportunity to let other players go bankrupt was not interpreted as the objective in the game by the Taiwanese students. If any player was low on cash, he was helped by other players so that bankruptcy was avoided. The teachers were stunned by this result of the game. (Mayer, 2010)

The common factor in these examples is that the players were able to play the game within the set of given rules but it still resulted in highly unexpected behaviour. This implies that the group of players had a shared basis of unwritten rules that structured their behaviour during the game that was unknown by the designer and facilitator. This shared basis of unwritten rules can be dubbed the culture of that specific group of players (Caluwé, Hofstede, & Peters, 2008).

This culture-related behaviour changed the game in such a way that it is unlikely that the objectives of the game have been met in these sessions. There is no use in spending resources on a serious game if the objectives of the game cannot be reached. These examples in fact emphasize the conclusion drawn in the work of Hofstede (G. J. Hofstede, 2008); cultural aspects of serious games are of paramount importance to the acceptance and successful learning outcomes of simulation gaming sessions.

These conclusions affect serious gaming as a tool for complex multi-actor problems. A textbook example of such a complex multi-actor problem is the challenge India faces regarding the generation of electricity. In order to accommodate the economic growth India needs to install an additional four times the current generation capacity in the coming 20 years (Expert Committee, 2006). This needs to be done in an arena where a variety of electricity generation techniques is available but also various economical, technical, political and managerial issues play a large role. This problem is classified as a multi actor, complex problem since multiple actors are involved bringing their conflicting interests to the negotiation table in a situation in which more than technical knowledge is needed to make decisions that work towards a solution. This challenge has been the subject of various research projects by CSTEP and other organizations. In order to convey the message that can be concluded from these research projects, the decision was taken to construct the Indian Electricity Game.

To avoid a scenario as sketched in the textbox, the Indian Electricity Game needs to be adapted to the culture of its players. It is possible to adapt serious games to the culture of the players by playtesting with these players (Fullerton, 2008). Playtesting is the iterative process in which the game is designed, tested and evaluated, each time improving the game, until the player experience meets your criteria (Fullerton, 2008). However, practice shows that this step is not always possible or desirable from the game designers point of view for two reasons. First, the development of new games is very costly and time-consuming (Duke & Geurts, 2004), due to a limited budget and time available it may not be possible to organize and facilitate such a testplay session with all the targeted players. Second, playtesting with the targeted players is undesirable from the point of view of the designers of the game because they want to make a good first impression. See for instance the CSTEP example in the textbox in which the funding for the project depended on the first impression of the game developed.

So adapting serious games to the culture of the targeted players by playtesting with them is not always an option. This report proposes a method that is able to adapt serious games to the culture of the targeted players without playtesting with these players.

Problem statement: Serious games are an important tool in creating, explaining, building, deploying and evaluating solutions for complex multi-actor problems. The Indian electricity challenge is such a complex multi-actor problem which forms the content of the Indian Electricity Game. To become a success it is necessary that serious games, like the Indian Electricity Game, are adjusted to the culture of its players. By playtesting with the targeted players, game designers are able to adjust their serious games to the culture of the targeted players. However, due to a lack of time, high costs and the need for a good first impression, playtesting is not always possible. Game designers need a serious game design method to support them in adapting their games to the culture of the targeted players without playtesting with these players.

1.2 Background and demarcation

Before stating the research questions based on the formulated problem statement, this section provides background and demarcates the problem by means of the theoretical basis of this research. The theoretical basis consists of two interrelated frameworks of (Meijer, 2009) and (Williamson, 2000). The first framework describes the inputs and outputs of a serious game session, including the relation between a serious game session and the culture of the players. The second framework describes this culture and integrates it with the different environments in which complex multi actor problems are dealt with. After the description of the two frameworks, this theoretical basis was used to structure the demarcation of this research. It also functioned as the foundation of the evaluation set up in chapter 5.

The first framework of the theoretical basis of this research is a model adapted from (Meijer, 2009) which provides an overview of all the inputs and outputs of a gaming session. Culture forms part of the input of a gaming session [1], as shown in figure 2.

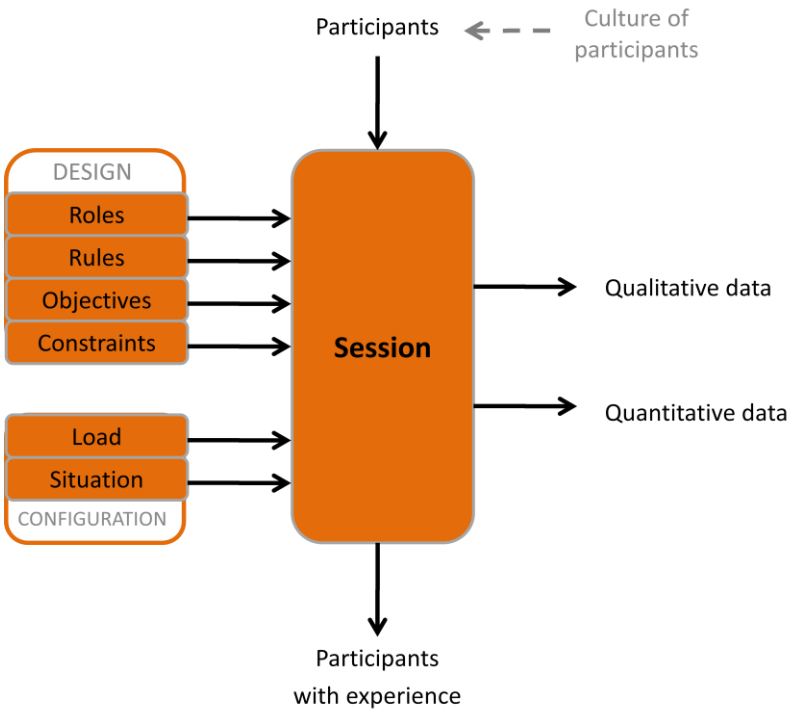

Figure 2 – The Inputs and outputs of a gaming session, adapted from Meijer (2009)

This model is briefly described here, whereas a more extensive explanation can be found in (Meijer, 2009). In order to play a session with participants, a design and a configuration are needed. The outputs of the session are quantitative and qualitative data together with the experience the participants gained during the session.

[1] It should be noted that this statement, and thereby the theoretical basis of this research, conflicts with the theory of the magic circle. The magic circle is a widely used theoretical concept introduced by (Huizinga, 1955) which claims that the World in which a game is played is completely isolated from the real world (Harvey, 2006; Paras & Bizzocchi, 2005; Salen & Zimmerman, 2004). In this research (Consalvo, 2009; Fine, 1983) are followed who both concluded that the real world will always intrude into the gameplay.

Design

The design constitutes the 'roles', 'rules', 'objectives' and 'constraints' of the game, terms based on (Gibbs, 1974).

- Roles define the possible action and objectives for both players and facilitators.
- Rules limit the behaviour of the players in order to simulate the limitations of the real world or as an artificial construct to change the behaviour of the players.
- Objectives in this model correspond with the objectives in the game as described in the section on terminology. The objectives in the game are the goals given to players or teams of players which together form the incentive structure steering the actions in the game.
- Constrains limit the actions possible by limiting the possible values of variables in a game.

Configuration

Using a single design different sessions can be formed by changing the configuration consisting of the load and situation.

- The load, a term used after (Wenzler, 2003), are the values of parameters in the design of the game that can be changed for each session. Examples are how much money to start with or how many people constitute a team.
- The situation is defined by the values of the parameters which are not part of the design of the game. This includes the selection of the players and the reason why they participate as well as the amount of information they received on beforehand.

Participants

With the design and configuration discussed, the participants complete the total input for a session. Part of what the participants bring to the game is their culture [2]. Culture exists at national, regional and corporate levels (Watson, Ho, & Raman, 1994). Culture is associated with beliefs, norms, mores, myths, value systems and structural elements of a specified group of people (Nath, 1988). This implicates that not contesting your superior as a sign of respect is considered culture. But also the use of five year plans for macro economical planning by the government is considered culture. Because of this broad applicability of the term culture, the theoretical basis of this research was extended with a second framework.

[2] Next to their culture, participants also bring their personality to the game. The behaviour of the participants can be explained by a combination of culture and personality traits. (See for theory on personality traits (Eysenck, 2006).) As a consequence culture cannot be observed directly, which is why in this research a group test is used as a proxy for the collective parts. It is acknowledged that such a group test will not reveal whether the collective parts stem from personality or culture. However, a group test as such is considered the best proxy for culture. The individual differences in the group test are left out of the scope of this research as they can be explained by either personality or variation in the measurements.

A model was used that integrates culture with the different environments in which complex multi-actor problems are dealt with. This integrating model is the four layer model of Williamson on new institutional economics (Williamson, 1998, 2000). See figure 3.

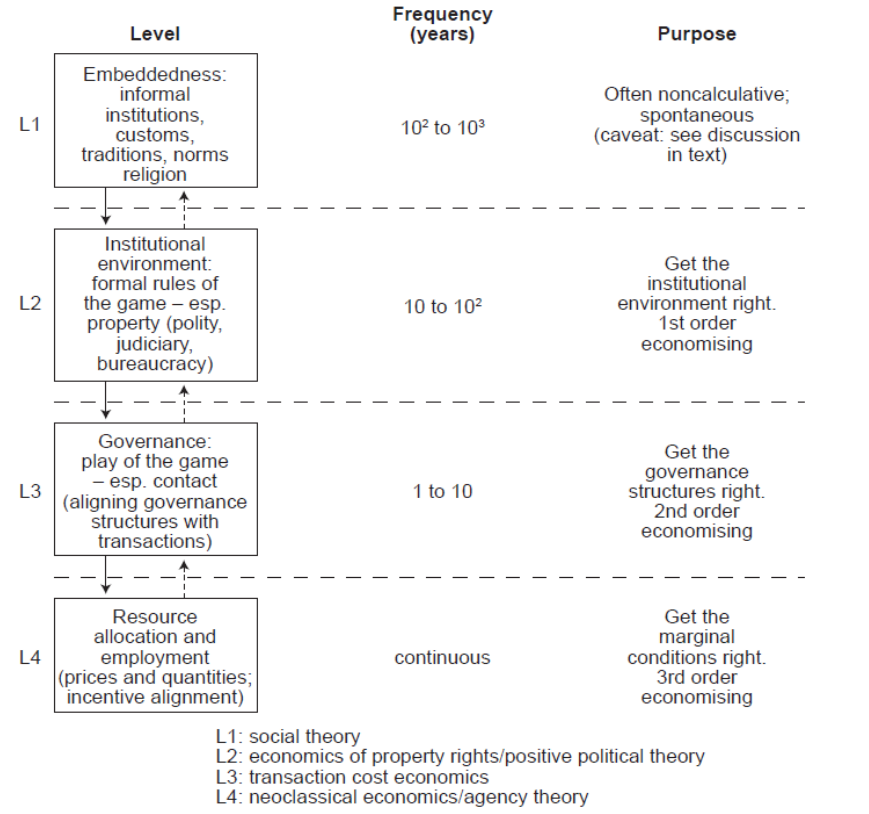

Figure 3 – Four layer model of Williamson (2000)

The four layer model of Williamson is briefly discussed here based on his work (Williamson, 1998, 2000) and the interpretation of (Meijer, 2009).

The model consists of four layers of social analysis, each with its own time scale which gives an indication of the pace of change in that level. At the first level informal institutions are listed like customs, traditions, norms and religion. These informal institutions change very slowly with a frequency estimated in terms of centuries. Level 2 incorporates the institutional environment. This includes the formal rules within society like laws. Level 3 is called governance and is about how different entities interact given the institutional environment. This includes the different types of contracting. At the fourth level the functioning of the firm itself is optimized by means of resource allocation and employment. This is a continuous process.

The arrows connecting the different levels indicate that the higher levels influence the lower ones. For example the informal institutions from level 1 influenced the formation of the laws in level 2. But the institutional environment in level 2 is not completely determined by the informal institutions in level 1. Parts of the institutional environment are consciously designed by going beyond taboos, customs, traditions, and codes of conduct. This structure of influence and design also applies to the lower levels of social analysis in the framework.

As stated, this four layer model integrates culture with the different environments in which complex multi-actor problems are dealt with. Applying the model to the complex multi-actor problem of the Indian electricity challenge provides the following example elements from the environments in which the electricity challenge needs to be solved.

- Level 1 – Informal institutions: Example of norms and values: From the perspective of respect the average Indian will not contradict its superior.
- Level 2 – Institutional environment: Examples of the legislative structure of India: the Indian Electricity Act and the Energy Conservation Act.
- Level 3 – Governance environment: Examples of alignment of governance structures with transactions: Five year plans for macro economical planning and the New Hydro Policy.
- Level 4 – Resource allocation: Examples of the actual business: actual cost price electricity generation, specific subsidies for renewable electricity generation.

All these elements of the complex multi-actor environment are part of the culture that players bring to the game. As shown in the example, complex multi-actor problems often stretch to multiple levels of the four layer model. But although all the levels are relevant, the choice was made to focus this research on the influence on games by the informal institutions situated in the first level of the model of Williamson. The influence of the institutional environment and the different governance structures are left out of the scope of this research.

This choice to focus on informal institutions was made since in this field the largest contribution can be made in supporting serious game designers. Assessing the culture of the institutional or governmental environment concerns the more tangible concepts of policies, laws and regulations. For these assessments tools are available to the professionals working with complex multi-actor problems like policy analysis (Bruin & Heuvelhof, 2002), network analysis (Bruin & Heuvelhof, 2002) and systems engineering (Sage & Armstrong, 2000).

This choice is possible since informal institutions and the institutional and governmental environment are analyzed in complete different ways. Institutional and governmental culture is assessed through researching the institutions, laws and regulations which are in place by means of the methods mentioned above. The culture from informal institutions can be assessed by means of questionnaires and observing participants. This makes these assessments completely separate tasks which opens the possibility to focus on one in this thesis project. The consequences of this choice are reflected upon in chapter 7 – Discussion and Reflection.

Now the theoretical basis was described and the research demarcated a final remark needs to be made regarding the term culture as it is used in this report. As stated, elements from all the complex multi-actor environments are part of the culture that players bring to the game. This research is demarcated to the influence of the informal institutions situated in the highest layer of the four layer model. Although culture is more than the informal institutions, the term culture in this report refers to the these informal institutions only. This is in line with the interpretation of the four layer model by (Meijer, 2009).

1.3 Research questions

The problem statement in the first section leads to the following main research question:

> *What method is able to adapt serious games to the culture of the players without playtesting them with these players?*

To answer the main research question, the following research questions need to be answered;

1. Which serious game design methods are available? *(theoretical)*
2. How do existing serious game design methods adapt serious games to the culture of the players? *(methodological)*
3. Which existing serious game design method has the best structure that can be used as a starting point for the design of a method that is able to adapt serious games to the culture of the players. *(choice of method)*
4. What are the requirements for a method that is able to adapt serious games to the culture of the players? *(design requirements)*
5. What method can be developed that is able to adapt serious games to the culture of the players without playtesting them with these players? *(design)*
6. Is the designed method able to adapt serious games to the culture of the players without playtesting them with these players? *(evaluation of design)*
7. Which recommendations can be made for the use of the designed method in combination with other serious game design methods? *(generalization)*

By posing question three an assumption is consciously made; it is possible to use an existing SGD method as a starting point for the design of a method that is able to adapt serious games to the culture of the players. This assumption is fairly safe for two reasons.

First, in modular SGD methods a structure is present that makes it relatively easy to include a new module, in this case a module that copes with the culture of the players. Modularity is used to provide an overview of the entire system and to make it easier to insert and remove elements from the system (Parnas, Clements, & Weiss, 1984). An analysis showed that many SGD methods are modular.

Second, adding a module or iteration that copes with the culture of the players does not radically change the SGD method and will therefore not create barriers to use such a SGD method as starting point. Generally, in iterative SGD methods the steps of design, test and evaluate are repeated. Therefore it is possible to add an iteration that copes with the culture of the players and adjust the design according the test results. As many SGD methods have an iterative element, it is plausible that an existing SGD method can be enriched with an iteration that supports serious game designers in adapting their game to the culture of the players.

The assumption is validated by answering question five and discussed in section 7.1.

Objective of research:
To design a serious game design method that supports its users in adapting their games to the culture of the players without playtesting theme with these players

1.4 Research method and instruments

To provide answers to the research questions posed, a research method is presented here. A research method is the structure of the project which is used as a guideline throughout the process. For this project two existing research methods were combined; the META model of (Herder & Stikkelman, 2004) and the spiral model of (Boehm, 1986). In this section it is explained why the research method for this project was formed out of these two existing research methods. After the explanation of the research method, the research instruments are introduced.

The objective of this research was to design a serious game design method which supports game designers in adapting their games to the culture of the players without playtesting them with these players. The design of a design process typically starts as an ill-posed problem (Westerberg, Subrahmanian, Reich, Konda, & group, 1997). This project was such an ill-posed problem as well; it is hard to define something as abstract as culture (Schein, 2004, pg. 15). Thereby, serious game design is young and dynamic branch of science (Salen & Zimmerman, 2004) in which the standards of today are revised tomorrow. In order to overcome this ill-posed problem, the META Model of Herder starts with a system analysis and the development of the design space (Herder & Stikkelman, 2004). These are independent steps, structuring the research and preparing the start of the design phase. These first two steps form the analysis phase of the project.

The analysis phase is followed by the design phase. Iteration is essential for generating value in design processes (Ballard, 2000). Because of that, many design methodologies include an iterative element, like the design cycle of (Takeda, Veerkamp, Tomiyama, & Yoshikawa, 1990), the spiral model of (Boehm, 1986), design science as described by (Hevner, March, Park, & Ram, 2004) but also the META model (Herder & Stikkelman, 2004, pg. 3880). The design phase is structured by the phases defined in Boehm's spiral model. Boehm identifies three main phases; design, develop tests and evaluate (Boehm, 1986). The reason that the spiral model of Boehm was chosen is that this model emphasizes the importance of the development of tests. As it is discussed in the description of case studies later in this section, the evaluation step is particularly important in this project. These steps together form the second phase; the design phase.

After several iterations the conclusions are drawn in the third phase. In figure 4 the research method is visualized together with the research questions answered in each step.

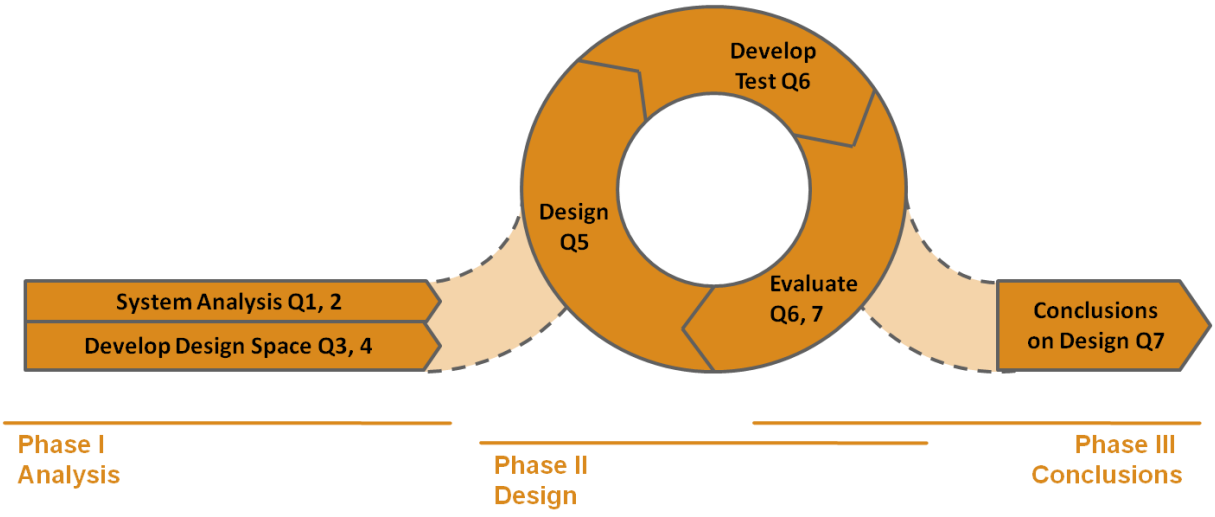

Figure 4 – The research method

Research instruments are tools used to conduct the steps defined in the research method. Each step may use multiple research instruments. During this project four research instruments were used; literature reviews, conference visits, interviews and case studies. In this section they are shortly described.

Literature review
Literature review was predominantly used in the beginning of this project when two fields of science were explicitly addressed; the field of sociology and the field of serious gaming. In both fields different streams exist. During the system analysis a number of scientific publications, books and conference proceedings were analyzed to provide an answer to the research questions.

Conferences
In the beginning of the project several conferences (or lectures, readings, discussion groups and section meetings) were attended on various topics related to this project. Although maybe unusual in a thesis project, these conferences were particularly valuable in the process of mapping the problem into its context. Next to that it helped specifically in understanding the Indian electricity challenge.

Interviews
Interviews are efficient and relatively simple ways to gather knowledge of field experts. Despite the critique that interviewees are influenced by the type of questions asked and the relationship with the interviewer, it is still a regularly used method in the academic world (Eisenhardt, 1989; Lenski & Leggett, 1960). In this project interviews were used to validate the choices made based upon literature review and case studies. The interviewees were experts in the field upon they are questioned.

Case Study
A case study is an “in depth investigation of a single individual, group, or event to explore causation in order to find underlying principles” (Yin, 2003). Case studies help to evaluate the benefits of methods and tools in a cost-effective way (Kitchenham, Pickard, & Pfleeger, 1995). In this research case studies were used to evaluate the culture driven game design method. This is the serious game design method designed in this research. In these case studies the Indian Electricity Game was used. Case studies were chosen as the evaluation method because of the in depth character of the investigation. This thoroughness is a necessary character since culture related behaviour shows itself in details.

Disadvantage of the case study is the restricted generalizability (Yin, 2003). It is therefore that the culture driven game design method was evaluated instead of validated. To validate the method the following statement should be tested: The culture driven game design method is able to adapt serious games to the culture of the players without playtesting with these players. However, this statement is unfalsifiable since the amount of experiments needed is infinite in terms of different serious games and possible players. Based on the principles of falsification by Karl Popper it is therefore not possible to conclude the statement is valid.

The statement that can be tested based on the case studies conducted is: The culture driven game design method is able to adapt the Indian Electricity Game to the culture of different groups of players without playtesting with these players. Thereby, detailed critique can be gained from an in-depth study like a case study. In this early stage of the development of the culture driven game design method, this detailed critique is more valuable than the generalizability as improvements can be made to the culture driven game design method after these first case studies (Abercrombie, Hill, & Turner, 1994). Therefore, despite the restricted generalizability, a case study was chosen to evaluate the culture driven game design method.

1.5 Structure of the report

As this research was structured by the research questions, so is this report. It was stated in section 1.1 that serious game designers need a method to support them in adapting their games to the culture of the players without playtesting with these players. In chapter 2 several existing serious game design methods are analyzed on how they provide this support. In chapter 3 the design space for the design of the new culture driven game design method is set. To provide a foundation for this method, one of the existing serious game design method is selected. Next to that, the requirements for the new method are set. In chapter 4 the design space is explored and the culture driven game design method is developed. In chapter 5 the set up evaluation of the culture driven game design method is described followed by the results of the evaluation in chapter 6. In chapter 7 these results are discussed and a reflection is presented on the research. The conclusions and recommendations are stated in the final chapter 8.

CHAPTER 2 – COMPARING EXISTING SERIOUS GAME DESIGN METHODS

In the problem statement it was exemplified that in order to become a success it is necessary that serious games, like the Indian Electricity Game, are adjusted to the culture of its players. By playtesting with the targeted players, game designers are able to adjust their serious games to the culture of the targeted players. However, due to a lack of time, high costs and the need for a good first impression, playtesting is not always possible. In search of other ways to adjust serious games to the culture of the players a life cycle analysis was conducted in section 2.1 that concluded that a game should be adapted to the players' culture in the design phase. This design phase of a game is structured by a serious game design method. It is therefore that in this chapter several serious game design methods were analyzed on how they support serious game designers in adapting their games to the culture of the players. This analysis concluded that none of the existing serious game design methods adapts serious games to the culture of the players.

The structure of this chapter is as following: in section 2.1 the life cycle analysis is described which concluded that adapting the game to the culture of the players should be done in the design phase using a serious game design method. Section 2.2 addresses the field of serious game design methods by explaining why the amount of serious game design methods is limited. Next to that a framework is introduced which classifies serious game design methods according two important characteristics. This framework was used to structure the analysis of four serious game design methods in sections 2.3 to 2.6. These analyses were done following a similar path for each method. After a brief introduction, the method is described. Next it is analyzed how the serious game design method supports its users in adapting the game to the culture of the players. Each section devoted to a method ends with the conclusions regarding the specific method. Having covered the four serious game design methods, the conclusions were drawn in section 2.7.

2.1 Life cycle analysis: dealing with the players' culture during the design

Life cycle analysis, or life cycle assessment, is a technique for systematically analyzing a product form cradle to grave (Owens, 1997; Vigon, Tolle, Cornaby, & Latham, 1993). This technique is mainly used to evaluate the environmental impact of a product (Vigon, et al., 1993). But the use of a life cycle analysis is not limited to this purpose, as it is also used in systems engineering (Sage & Armstrong, 2000). Through this analysis it was examined in which phase of the life cycle of a game the culture related behaviour of players should be dealt with. In the first subsection (2.1.1) the life cycle phases of a serious game are described. In the second subsection (2.1.2) the conclusions of the systematic analysis of these phases are presented.

2.1.1 The life cycle phases of a serious game

In their extensive description of various life cycle analyses Sage and Armstrong stated that a typical systems engineering life cycle has three basic phases; definition, development and deployment (Sage & Armstrong, 2000). A brief description of the translation of these phases for the life cycle of a serious game:

- Definition phase – This is the phase before the actual design commences. In this phase the problem or opportunity is identified and it is concluded that a serious game may be the collaboration technique that is needed.
- Development phase – The conclusion to make a serious game is also the kick-off of the development phase. In this phase the subject of the game is worked out and the game is designed. The end result of this phase, the designed game, corresponds with the design in the theoretical basis of this research as discussed in subsection 1.2. The development phase ends (eventually) with the transfer of the game to the client.

- Deployment phase – The deployment phase is the phase in which the game is played. Four sub phases follow from the general set up of serious games:
    - Set up – In the set-up of the game the session is prepared. This sub phase corresponds with the configuration in the theoretical basis of this research.
    - Introduction – During the introduction of a serious game the purpose and the rules of the game are explained.
    - Play – The game is played.
    - Debriefing – During the debriefing of a serious game the results of the game are discussed and directed back to the purpose of the game.

  The sub phases introduction to debriefing correspond with the session in the theoretical basis of this research.

The life cycle phases of a serious game are depicted in figure 5.

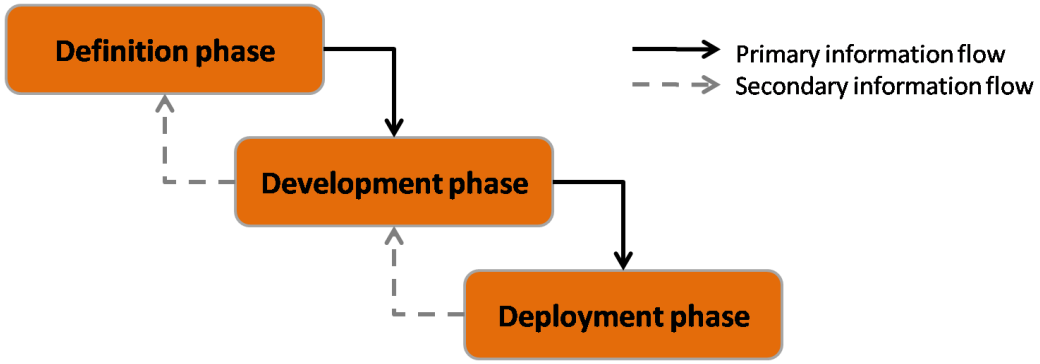

Figure 5 – The life cycle phases of a serious game

2.1.2 Conclusions of the life cycle analysis

It is not possible to adapt the game to the culture of the players during the definition phase. The reason for this conclusion is as short as it is simple: at this point in the process, only the targeted audience is known, and not the actual players. It is not possible to adapt a game to the culture of a certain set op players when the identity of these players is unknown.

In contrast with the definition phase it is possible to adapt the game to the players' culture in the final deployment phase. A facilitator can be given a set of guidelines in which mitigating measures are described that can be used when the facilitator notices that some of the players are uncomfortable with some of the game elements. An example of such a set of guidelines is given in (G. J. Hofstede, 2008). But a facilitator is unable to change a game radically at the moment of play. A radical change is necessary when the culture of the players collides with game elements that form the core of the game.

Take for instance an explorative game in which managers and subordinates have to come with creative ideas to improve the performance of a company. When the game is played with players that have a very hierarchical culture, the fear for repercussions can withhold the subordinates to speak freely (G. J. Hofstede, 2008). This will therefore limit their own creative capacity as well as the creative capacity of the group. Here the players' culture collides with one of the core elements of the game; the group composition. When the facilitator notices that fear for repercussions plays a role it is too late to adapt the game. The facilitator cannot halfway the game suspend the managers in order to free the subordinates from the fear for repercussions.

It is therefore concluded that adapting the game to the players' culture should be done during the development phase of the game. Small adjustments can be done by the facilitator in the deployment phase but in order to prevent a conflict between the core elements of the game and the players' culture, the culture of the game should aligned with players' culture in the development phase. Since the development phase is structured by a serious game design method, this method should be able to adapt serious games to the players' culture. If this is not the case, the game designer may be confronted with the consequences when the game is played. It is therefore that in the proceeding sections several serious game design methods are analyzed on how they adapt games to the culture of the players.

2.2 A Framework to classify SGD Methods

Before the analysis of the serious game design methods is described this section provides some background on the field of serious game design methods. Through literature research, visiting conferences and discussions with professional serious game designers it became clear that the number of SGD methods is limited. The reasons for this limited number of methods are discussed in the first subsection (2.2.1). In the second subsection (2.2.2) a framework is introduced which classifies serious game design methods according to two important characteristics. This framework was used to structure the analysis of four serious game design methods in sections 2.3 to 2.6.

2.2.1 Limited number of SGD methods

Two reasons have come forward during research and discussions that explain the limited number of SGD methods. The first reason is straight forward: serious game design is compared to other design sciences a young discipline (Mayer, 2010; Salen & Zimmerman, 2004). None of the four SGD methods that are discussed in this chapter is older than 15 years of age. It is expected that when the science of serious game design gains maturity the number of SGD methods also increased. The second reason is that serious game design is more art than science. This is briefly explained.

The major problem in serious game design is balancing the imitated reality well enough to be used, yet sufficiently simple to played by classroom size groups in short time spans without elaborate equipment (Abt, 1970, pg. 43). Dealing with this problem requires a design process that combines logic and serendipity which makes it an artistic challenge (Duke & Geurts, 2004, pg. 277). This may be an explanation why the number of game design methodologies is limited, since artistic processes are less easy to frame into a methodology.

Several authors follow the same line of reasoning. "Game design concerns an art, because as with most 'designs', it involves inspiration, originality, creativity, innovation, skill and many other aspects that make it an 'art'" (Harteveld, 2010). Crawford takes the conclusion even a step further by stating that relying on procedures is "inimical to the creative imperative of game design" and that game design is therefore an activity far too complex to be reduced to a formal procedure (Crawford, 1984). However, all three quoted authors were able to develop a serious game design method. Crawford explains this by stating his method is not a normative formula but a set of suggested habits for the designer (Crawford, 1984, pg. 51).

2.2.2 Characteristics defining framework

In the previous subsection it was concluded that the amount of serious game design methods may be limited due to the young age of the discipline and the artistic character of game design. Despite this artistic character, the serious game design methods that exist can be classified using several design dimensions. In this subsection two design dimensions of serious game design methods were used to form a framework that distinguishes SGD methods from each other. Using the classification on the design dimensions of the analyzed serious game design methods, one of the methods was selected

to function as the foundation of a new method in chapter 3. However, because of the functionality of the framework to classify the serious game design methods, the framework was used in this chapter to structure the analyses of four serious game design methods in sections 2.3 to 2.6.

The two design dimension that stretch up the framework are

- The design approach dimension – runs from waterfall models to agile, or spiral, models. Both the waterfall and the agile model are two basic design approaches (Cadle & Yeates, 2001). The waterfall model is a typical stage-by-stage model whereas the agile model combines this with an evolutionary approach (Kar & Verbreack, 2007).
- The platform dimension – originates from the field of game design science. Harteveld uses the distinction between analogue and digital games. Digital games are games with a computerized backbone. The distinction is less rigid as it may seem. Many digital serious games use live player interaction to simulate negotiation and decision making processes. Many analogue games use spreadsheets to calculate the feedback to the participants (Harteveld, 2010). However, scanning through the available serious game design methods shows a more clear distinction. Some of the methods are specifically created for the design of digital games. In these methods special attention is devoted to the design of the digital component of the game, the programming process. Other methods can, according to their authors, be used for both analogue as digital game design "because the same principles of design can be applied to all sorts of games" (Harteveld, 2010).

The two design dimensions stretch up the framework depicted in table 1. For each combination a serious game design method is considered.

Table 1 – Framework of serious game design methods

		PLATFORM DIMENSION	
		Analogue & Digital games	Digital games only
DESIGN APPROACH DIMENSION	Waterfall	*Duke, Geurts* §2.3 Design Sequence	*Crawford* §2.5 Game Design Sequence
	Agile	*Kortmann, Harteveld* §2.4 Triadic Game Design Development Method	*Fullerton* §2.6 Playcentric Approach

As it is stated in the respective sections, the classification of the methods on the design dimensions appears far more rigid than it actually is. For now, however, it provides the structure to assess the four serious game design methods in the coming sections.

2.3 Duke & Geurts – Design Sequence

Richard D. Duke requires no introduction in the world gaming. He is dubbed the "founding father of gaming as a discipline" and wrote some of "the most authoritative textbooks on gaming" (Caluwé, et al., 2008). A widely accepted approach to game design is the design sequence of Duke and Geurts (Duke, 1974; Duke & Geurts, 2004). This approach consists of five phases with 21 steps nested therein.

In the framework of serious game design methods the design sequence was placed at the intersection of *waterfall* and *analogue & digital* game design methods. The 21 steps described in the design sequence allow the designer to proceed systematically as in a linear model (Duke & Geurts,

2004). Next to that the design sequence does not include any software specific steps or phases and therefore will not differentiate between analogue and digital games (Harteveld, 2010).

2.3.1 Description of method

The five phases are briefly described here. For a more elaborate description of the method please refer to (Duke & Geurts, 2004, pg. 276-305).

Phase 1 – Setting the stage for the project

The first phase has five steps embedded which serve to guide the remaining development process. It includes activities like defining the problem and setting the goals of the project.

Phase 2 – Clarifying the problem

The purpose of the second phase is to finalize the cognitive mapping process. This is a very important step which is emphasized by Duke and Geurts by stating that no less than a third of the resources should be spend on clarifying objectives, developing the problem statement and developing the concept report. Phase 2 includes 3 separate steps.

Phase 3 – Designing the policy exercise

The third phase is concerned with the creation of a blueprint for the exercise in the form of a concept report. It includes selecting the systems components, game elements and techniques to be used. The five steps in phase 3 end with writing the concept report. This concept report needs to be authorized by the client.

Phase 4 – Developing the exercise

In the fourth phase the design team goes through the three stages of design, being prototyping, evaluation and graphics design. Duke and Geurts plea for the application of the rule-of-ten runs before the game is completely calibrated. Phase four consists of three steps.

Phase 5 – Implementation

Phase five must ensure proper use of the exercise by its client. In this five step phase the exercise gradually leaves the designers world and enters the clients world. These steps are crucial for the success of the exercise.

2.3.2 Adapting games to the players' culture

An analysis was conducted assessing how the design sequence supports its users in adapting their games to the players' culture. This analysis showed that out of the 21 steps, step 17 is the only step that mentioned culture as an issue to be dealt with. This step is discussed here.

Step 17 is embedded in the fifth and final implementation phase. In this step the serious game is integrated into the client's environment. During the step of integration the cultural transition should be dealt with in order "to achieve a better fit within the clients corporate culture" (Duke & Geurts, 2004). According to the authors, the corporate culture includes industry-specific jargon, corporate procedures and the application of the company logo and artwork (Duke & Geurts, 2004). It is necessary to deal with this specific culture, but it is not the culture this research refers to. The culture in this research regards the informal institutions as explained in the theoretical basis of this research in section 1.2.

2.3.3 Conclusions

While Duke and Geurts' design sequence has its merits, it does not provide means to adapt games to the players' culture. Culture, as described in the theoretical basis of this research, is not mentioned in the extensive description of the 21 step method.

2.4 Kortmann & Harteveld – Triadic Game Design development model

The second game design method that was analyzed is the Triadic Game Design development method (TGDdm) of (Kortmann & Harteveld, 2009). The TGDdm is based on the Triadic Game Design philosophy described in (Harteveld, 2010). This method is a first step toward to an agile game development model based on the design sequence of Duke and Geurts combined with experience gained from software engineering (Kortmann & Harteveld, 2009).

In the framework of serious game design methods the Triadic Game Design Development Method was placed at the intersection of *agile* and *analogue & digital* game design methods. The agile character, expressed by the feedback loops, was extensively described and presented as the mayor improvement in comparison with the design sequence of Duke and Geurts (Kortmann & Harteveld, 2009). Although the TGDdm was inspired by the discipline of software engineering, no specific attention was devoted to software programming in the description of this method. The TGDdm is applicable to both analogue and digital games.

2.4.1 Description of method

The Triadic Game Design philosophy requires game designers to deal with three components; reality, meaning and play (Harteveld, 2010; Harteveld, Lukosch, & Kortmann, 2009; Kortmann & Harteveld, 2009). Each component has its own disciplines, experts and criteria. Yet, the components are inherently connected to each other (Harteveld, 2010). For instance if the play component is not related to the reality component, the game becomes unplayable since no person can relate to it. Throughout the design of the game these three components need to be balanced, only then "players go through a meaningful experience, related to reality, in a playful manner" (Kortmann & Harteveld, 2009).

The three components are developed in parallel trough five phases. These phases can be replaced by the phases from the approach of Duke and Geurts (Kortmann & Harteveld, 2009). As depicted in figure 6 many iterative decision moments are build in. This ensures a 'customer-on-side" development process. See (Kortmann & Harteveld, 2009) for a more extensive description of the TGDdm.

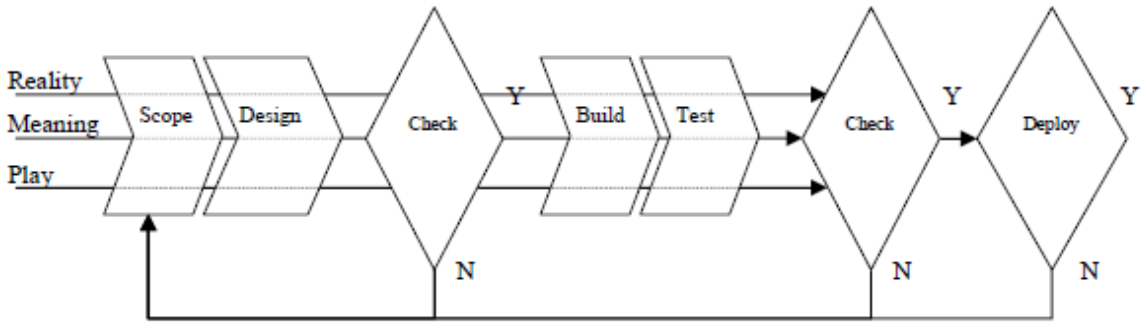

Figure 6 – The Triadic Game Design development model of Kortmann & Harteveld (2009)

2.4.2 Adapting games to the players' culture

In the introduction of the paper *Agile game development: lessons learned from software engineering* Kortmann and Harteveld posed the following question: "How can we improve the existing models to support game development projects?" (Kortmann & Harteveld, 2009). This question was posed just after summing up four reasons of substandard performance in game development. None of these reasons relate to the players' culture as formulated in the theoretical basis of this research. This

raised the expectation that neither the TGDdm supports the serious game designer in adapting the culture of the game to the players' culture.

The Triadic Game Design philosophy requires game designers to deal with three components; reality, meaning and play (Harteveld, et al., 2009; Kortmann & Harteveld, 2009). People affiliated with these components during the game design are; subject-matter experts for the reality component, teachers and storytellers for the meaning component, and game designers and media specialists for the play component (Kortmann & Harteveld, 2009). It must be concluded here that there is no culture component, neither is there a culture specialist involved.

The three components are developed in parallel trough five phases. These phases can be replaced by the phases from the approach of Duke and Geurts (Kortmann & Harteveld, 2009). Therefore the same conclusion can be drawn as it was done in the analysis of the design sequence of Duke and Geurts: in the steps defined, the players' culture is not addressed explicitly.

A final remark needs to be made. The structure of the TGDdm is iterative, it includes repetitive playstesting. These iterations in the development cycle with the 'customer on-side' allow collaborative adaption of the scope, design and built artefact (Kortmann & Harteveld, 2009). This allows the use of playtesting with the targeted players as a method to adjust the game to the culture of these players. However, it is not stated that a playtest session should be organized in order to adapt the game to the culture of the players. It is therefore concluded that the TGDdm does not support game designers in adapting their games to the culture of the players.

2.4.3 Conclusions

Regarding the Triadic Game Design development model it can be concluded that this method does not support its users in adapting the game to the players' culture. Remark that comes with this conclusion is that the structure of this method allows playtesting with the targeted players as a method to adjust the game to the culture of these players. However, it is not stated that a playtest session should be organized in order to adapt the game to the culture of the players.

2.5 Crawford – The game design sequence

Chris Crawford developed the game design sequence using his experience as a computer game designer. The sequence consists of seven phases which provide guidelines for the game designer throughout the process.

In the framework of serious game design methods the game design sequence was placed at the intersection of *waterfall* and *digital-only* game design methods. The author stated straight forward that the game design sequence is the procedure "by which a computer game should be designed and programmed" (Crawford, 1984, pg. 51). This characterized the method for digital games only.

The characterization of the game design sequence as a waterfall model is less obvious. The author stated that the design sequence is to be used as a set of guidelines instead of a step to step model (Crawford, 1984). But in contrast with this single statement, the twelve page description of the method follows a strict waterfall approach. Each phase begins with stating that the preceding phase is finished and the results of that phase are used in this next. This is why this method was placed on the waterfall side of the framework.

2.5.1 Description of method

The game design sequence consist of seven phases. These seven phases are briefly described here. For a more elaborate description of the method please refer to (Crawford, 1984, pg. 51-63).

Phase 1 – Choose a goal and topic

In the first phase the goal and topic of the game are chosen. Crawford argues that this is ignored by many game designers despite the vital importance. Goals help to make the choices over tradeoffs which will inevitably come up in the design phase.

Phase 2 – Research and preparation

The second phase embodies thorough research on the topic chosen in the previous phase. It is very important that the game designer does not write any code in this phase. During this phase a large variety of ideas will be generated.

Phase 3 – Design phase

Now the designer has a clear idea of the game's ideals it is time to create the outline of the interdependent structures of the game being; I/O structure, game structure and program structure. After this phase a decision moment is build in. At this point the choice should be made to abort or to proceed with the design of the game since after this point the real costs will be made.

Phase 4 – Pre programming phase

In this phase the ideas that were generated are put on paper. This phase prepares the complete game documentation.

Phase 5 – Programming phase

This phase is described in a few sentences stating that programming is "a straightforward and tedious work".

Phase 6 – Playtesting phase

During the playtesting phase fundamental design and programming problems are revealed. Within this phase Crawford defines two forms of playtesting which should be conducted in a prescribed order. The first being playtesting to eliminate all programming bugs. After the software is bug free the second round of playtesting can commend. In this round of playtesting the players should discover the bugs in the game structure.

Phase 7 – Post mortem

The last phase provides some guidelines to the game designer how to deal with criticism and failure.

2.5.2 Adapting games to the players' culture

Culture, or any form of adaptation to the culture of the targeted players, is not mentioned in the description of the game design sequence. Instead of supporting its users in adapting their games to the culture of the players, the game design sequence sets a trap for the designer. In phase 6 a team of playtesters is assembled. It is suggested that the playtesters should be selected based on the amount of experience they have with playing (or even designing) games. This creates a homogeneous group of playtesters with an above average comfort for playing games. This increases the chance that the culture of this group of playtesters will not match the culture of the targeted participants. If these cultures are not aligned this will lead to a game which is not adapted to the culture of the players. This example emphasizes that the culture of the players is completely disregarded in the game design sequence.

2.5.3 Conclusions

The game design sequence of Crawford does not support its users in adapting the game to the culture of the players. Instead of supporting serious game designers it sets a trap for them by recommending playtesting with an homogeneous group of playtesters. This increases the chance that the culture of this group of playtesters will not match the culture of the targeted participants. If these cultures are not aligned this will lead to a game which is not adapted to the culture of the players.

2.6 Fullerton – Playcentric approach

The fourth method that is discussed is the playcentric approach. The playcentric approach is developed by Tracy Fullerton from the University of Southern California, School of Cinematic Arts, Interactive Media Devision. This game design method is described in the book *Game design workshop: a playcentric approach to creating innovative games* (Fullerton, 2008).

Central element in the playcentric approach is the recurring playtesting. This iterative method emphasizes the importance of inviting feedback from players early on in the design process. According to Fullerton this is the key to designing games that delight and engage the audience because the game mechanics are developed from the ground up with the player experience at the centre of the process (Fullerton, 2008, pg. 2).

In the framework of serious game design methods introduced in section 2.1 the playcentric approach was placed at the intersection of *agile* and *digital-only* game design methods. The recurrent playtesting embodies the agile character of this method. The focus on digital games becomes stronger when proceeding through the method. Step 4 and 6 in the 7-step method contain the programming of the game. All the steps will be explained in the next subsection.

2.6.1 Description of method

Fullerton takes all the room to explain the playcentric approach. The extensive method description even includes ways to get a game publisher listening to your pitch. In this subsection a brief description of the method will be given based on (Fullerton, 2008).

As stated before, the playcentric approach is an agile method with playtesting as a recurring element. For each piece of design a design sequence is used, named iterative process diagram, which is depicted in figure 7. This design sequence has the following pattern: generation of ideas, formalization of ideas, testing of ideas and evaluation of results. When there are problems with the design a new iteration commences until there are no problems.

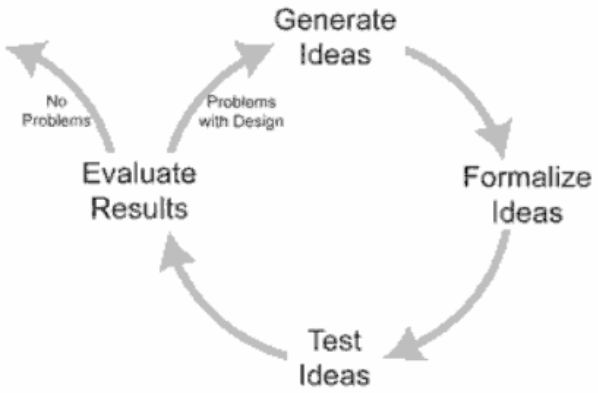

Figure 7 – Iterative process diagram of Fullerton (2008)

When all the pieces of design are put together a spiral model is created that flows through 4 phases as depicted in figure 8.

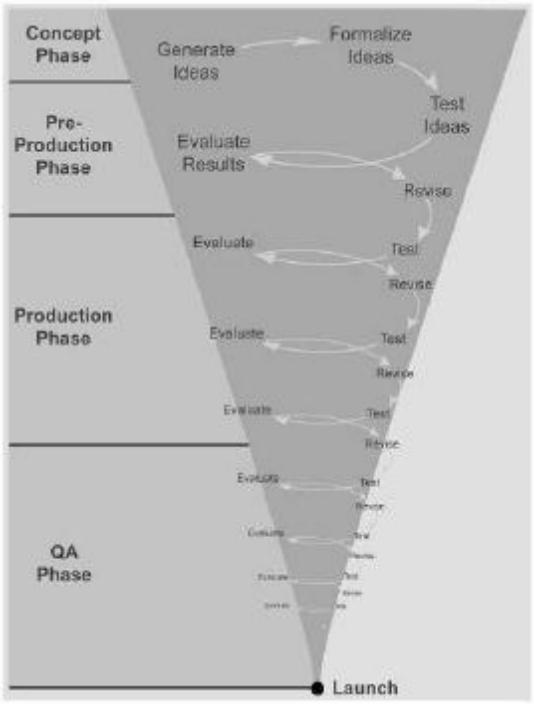

Figure 8 – Spiral model of the Playcentric Approach of Fullerton (2008)

These four phases correspond with seven iterative steps which form the core of the playcentric approach.

Step 1: Brainstorming

In step 1 the first game concepts are thought over and later on the list of ideas is brought down to the top three.

Step 2: Physical Prototype

In step 2 a physical prototype is made using conventional materials like pen and paper.

Step 3: Presentation (optional)

Step 3 is executed in order to secure funding for the prototyping team. A presentation is made including demo artwork and a solid gameplay treatment in order to convince investors or publishers.

Step 4: Software prototypes

In step 4 rough computer models are created of the core gameplay. Often multiple software prototypes are developed, each focusing on different aspects of the system.

Step 5: Design documentation

While making prototypes and working on the gameplay, several ideas have come up for the real game. In this step these ideas are put together in a design document.

Step 6: Production

In step 6 the actual programming takes place while using the design document. It is specifically noted that playtesting should be performed within this time consuming step regularly.

Step 7: Quality Assurance

In step 7 the gameplay should be solid. Minor gameplay issues may be changed but the quality assurance primarily focuses on usability.

Before proceeding with the analysis, an important remark should be made regarding the applicability of this playcentric approach to the design of serious games.

The key difference in the playcentric approach and a traditional game design process is in the type of design goals which are set (Fullerton, Furmanski, & Valanejad, 2007). As Fullerton states; "Play-centric design is design and technology at the service of the player experience." (Fullerton, et al., 2006) However, serious games are not intended to be played primarily for amusement. Serious games have an explicit and carefully thought-out educational purpose (Abt, 1970). Fullerton acknowledges this by stating that the design of serious games involves other goals than gameplay (Fullerton, 2008). In contrast with this statement, Fullerton used her playcentric approach to create an educational game on American history called *Participation Nation* (Fullerton, 2009). These inconsistent publications raise some doubt regarding the applicability of the playcentric approach to the design of serious games.

2.6.2 Adapting games to the players' culture

The playcentric approach prescribes an iterative design process through seven steps. None of these seven steps is focussed on adapting the game to the players' culture. Moreover, in none of these seven steps the culture of the players is mentioned as an issue to be dealt with. Remarkable, since a large part of the role of the game designer is to keep focused on the player experience (Fullerton, 2008). A possible explanation is related to the specific focus of the playcentric approach on entertainment games. Games with an entertainment purpose are designed to engage a large amount of people who are unknown to the designer. This in contrast with serious games which are generally designed for a smaller amount of people who are known to the designer. As stated in section 2.1, it is not possible to adapt a game to the culture of the players if the identity of these players is unknown which makes it impossible to adapt entertainment games to the culture of its players. Thereby, the size of the group of players may not allow the entertainment game to be adjusted to the specific culture of a subgroup of players. It is therefore that the focus on entertainment games may be an explanation why the playcentric approach does not support game designers in adapting their games to the culture of the players.

However, the same remark needs to be made as done in the analysis of the TGDdm. The structure of the playcentric approach is iterative, it includes repetitive playstesting. Fullerton emphasizes this by stating that "by watching other people play the game, you can learn a great deal" (Fullerton, 2008, pg. 3). This structure allows the use of playtesting with the targeted players as a method to adjust the game to the culture of these players. However, it is not stated that a playtest session should be organized in order to adapt the game to the culture of the players. It is therefore concluded that the playcentric approach does not support game designers in adapting their games to the culture of the players.

2.6.3 Conclusions

Regarding the playcentric approach it can be concluded that this method does not support its users in adapting the game to the players' culture. Remark that comes with this conclusion is that the structure of this method allows playtesting with the targeted players as a method to adjust the game to the culture of these players. However, it is not stated that a playtest session should be organized in order to adapt the game to the culture of the players.

2.7 Conclusions

In the problem statement it was exemplified that in order to become a success it is necessary that serious games, like the Indian Electricity Game, are adjusted to the culture of its players. By playtesting with the targeted players, game designers are able to adjust their serious games to the culture of these players. However, due to a lack of time, high costs and the need for a good first impression, playtesting with the targeted players is not always possible. In search of other ways to adjust serious games to the culture of the players a life cycle analysis was conducted that concluded that a game should be adapted to the players' culture in the design phase. This design phase of a game is structured by a serious game design method. It is therefore that in this chapter several serious game design methods were analyzed on how they support serious game designers in adapting their games to the culture of the players.

Table 2 – Framework of serious game design methods

		PLATFORM DIMENSION	
		Analogue & Digital games	Digital games only
DESIGN APPROACH DIMENSION	Waterfall	*Duke, Geurts* §2.3 Design Sequence	*Crawford* §2.5 Game Design Sequence
	Agile	*Kortmann, Harteveld* §2.4 Triadic Game Design Development Method	*Fullerton* §2.6 Playcentric Approach

The four serious game design methods shown in table 2 were analyzed. From these analyses, we can conclude that in order to adapt serious games to the players' culture, none of these existing serious game design methods provides an alternative to the known way of playtesting. Two of the four analyzed design methods, the Triadic Game Design development model and the playcentric approach, have a structure that allows playtesting with the targeted players. However, none of these two design methods explicitly state that a playtest session should be organized in order to adapt the game to the culture of the targeted players. It is therefore concluded that none of these existing serious game design methods supports game designers in adapting their serious games to the players' culture.

Critics of these conclusions may claim that the conducted analyses were too rigid. If a SGD method is able to adapt a game to the players' culture, depends for a large share on how the designer brings the method to practice. When, for example, the TGDdm subscribes 'customer on-side' collaborative adaption of the game, the designer can make a large contribution in adapting the game to the players' culture by carefully evaluating game elements according the critique given by the customers.

It is true that if the user of the SGD method is aware of the existence and potential impact of culture related behaviour, a large contribution can be made to the process of adapting the game to it. But instead of relying on this awareness of the designers, a good SGD method should notify its users and provide them with the tools to adapt the game to the players' culture. As shown in the problem introduction, the impact of culture related behaviour is far too critical to let it depend on the awareness of the designers. This leads to the conclusion that the analyses were rigid but justified because they are part of the development of a method that is able to actively support its users in adapting games to the culture of the players.

CHAPTER 3 – SETTING THE DESIGN SPACE FOR THE DESIGN OF A METHOD FOR CULTURE DRIVEN GAME DESIGN

In chapter 2 the system analysis was conducted. It was concluded that although the players' culture is relevant for the success of the game, none of the existing serious game design methods supports the designers in adapting their games to the culture of the players. This research proceeds with the design of the culture driven game design method; a serious game design method that is able to adapt serious games to the players' culture. In this chapter the design space for the design of the culture driven game design method is set.

Because of the overlap in function, an existing serious game design method is selected to function as the foundation for the culture driven game design method. The selection of this existing serious game design method is described in section 3.1. Next, the requirements for the design are stated in section 3.2. The conclusions are drawn in section 3.3.

3.1 Selection of a serious game design method to function as foundation

The first step in setting the design space is the selection of an existing serious game design method to function as the foundation for the culture driven game design method. There are two reasons why an existing serious game design method is selected. (1) The purpose of the culture driven game design method is to design a serious game which is adapted to the culture of its players. Since there is a lot of overlap with the purpose of existing serious game design methods (to design a serious game), an existing method can be used as foundation for the culture driven game design method. (2) The existing serious game design method is a proven method. This allows this research to keep the focus on the part of the culture driven game design method that adapts the game to the culture of the players.

The existing serious game design method is selected from the serious game design methods analyzed in chapter 2. In chapter 2 it was concluded that none of the existing serious game design methods adapts games to the culture of the players. Therefore the selection of the serious game design method is made based on the classification on the design dimensions that provides the best structure for the development of the culture driven game design method. To do so, the same framework of serious game design methods is used that structured chapter 2. The framework, shown in table 3, is based on two dimensions; the design approach dimension and the platform dimension. Below table 3 both dimensions are discussed after which the SGD method is selected.

Table 3 – Framework of serious game design methods

		PLATFORM DIMENSION	
		Analogue & Digital games	Digital games only
DESIGN APPROACH DIMENSION	Waterfall	*Duke, Geurts* Design Sequence	*Crawford* Game Design Sequence
	Agile	*Kortmann, Harteveld* Triadic Game Design Development Method	*Fullerton* Playcentric Approach

Regarding the design approach dimension an agile method is preferred over a waterfall method. This choice was based on the hard systems – soft systems discussion.

Hard systems thinkers assume that the present state and the desired future state of a system are known and can be fully described. Hard systems approaches consist of scientific methods and include quantitative modelling to find the optimal solution for the system studied (Kar & Verbreack, 2007). Soft systems thinkers do not make that assumption, they prefer to work with the different worldviews of actors. Soft systems approaches are able to cope with qualitative data and messy problems (Checkland & Poulter, 2010; Kar & Verbreack, 2007)

As stated in the problem introduction, this research is focused on serious games that deal with complex multi actor problems. Complex multi actor problems are problems in which multiple actors are involved, bringing their conflicting interests to the negotiation table in a situation in which more than technical knowledge is needed to make decisions that work towards a solution. These conflicting interests of multiple actors creates a socio-political complexity (Mayer, 2009), making the soft systems approach more capable of dealing with complex multi actor problems.

Compared to waterfall methods, agile methods are more in line with the soft systems approach. According to the definition of (Conboy, 2009, pg. 340) an agile method is able to *"rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality and simplicity), through its collective components and relationships with its environment."* The focus on change in order to contribute to the perceived customer value trough the relations with the environment make agile methods better capable of coping with the socio-political complexity of complex multi actor problems.

It is therefore concluded that an agile method is preferred over a waterfall method when selecting a serious game design method that functions as the foundation for the culture driven game design method.

The two agile SGD methods assessed in chapter 2 were the playcentric approach and the Triadic Game Development design method. Although the playcentric method is used by more game designers than the TGDdm, the choice was made to use the latter. Two reasons are given for this final choice: The first reason to use the TGDdm is that it is specifically stated that this method can be used for the design of both analogue and digital serious games. Second, the TGDdm is focused on serious gaming in contrast, as discussed in sub section 2.6.1, with the playcentric approach.

3.2 Requirements for a method for culture driven game design

In the previous section the design space has been narrowed down to the design of a culture driven game design method using the Triadic Game Design development model as the foundation. Before stepping into the design of the culture driven game design method, this section states the requirements for this method. These are the requirements set from the perspective of the end user of this method: the serious game designer. These requirements functioned as guidelines during the design process of the culture driven game design method and were used to structure the evaluation in chapter 5.

According to (Davis, 1993) a requirement is a specific purpose of a system, which a user can identify from a position external to that system. In this research the system is the culture driven game design method. There are two types of requirements; functional requirements and non-functional requirements (Robertson, 2001). Functional requirements are the things that a system has to do. A bottling system for instance has the functional requirement to fill bottles. These functional requirements are described in section 3.2.1. Non functional requirements are the qualities that a system has to have. How fast the bottling system needs to fill a bottle is for instance a non functional requirement. These non functional requirements are described in section 3.2.2.

3.2.1 Functional requirements

The functional requirements followed from the problem statement: to become a success it is necessary that serious games, like the Indian Electricity Game, are adjusted to the culture of its players. By playtesting with the targeted players, game designers are able to adjust their serious games to the culture of the targeted players. However, due to a lack of time, high costs and the need for a good first impression, playtesting is not always possible. Game designers need a serious game design method to support them in adapting their games to the culture of the targeted players without playtesting with these players. The main functional requirement is therefore:

The method must be able to adapt serious games to the culture of the targeted players without playtesting them with these players.

In order to provide guidance during the design of the method and to be able to evaluate afterwards this requirement is broken down to three sub requirements.

Input

- A.1 The method must be applicable to all types of serious games.
- A.2 The method must be applicable to all types of cultures.
- A.3 The method must not include playtesting with the targeted players.

Output

- A.4 The method must be able to adapt serious games to the culture of the targeted players.

3.2.2 Non functional requirements

To define the non functional requirements a serious game designer was interviewed. Interviewing stakeholders is the most traditional technique for discovering requirements (Robertson, 2001). Although this a useful technique in many situations, interviewing does not uncover all the requirements, unconscious and undreamed requirements go unnoted (Robertson, 2001). This weakness of interviews is enforced by the exploratory character of this research. The user does not explicitly know what he wants since the knowledge is not yet available (Vliet & Brinkkemper, 2001). It is therefore suggested to combine interviews with prototyping (Vliet & Brinkkemper, 2001) or another technique that allows the designer to get to know the system and its requirements better. However in these first iterations of the development of the culture driven game design method prototyping was not yet an option. The choice was therefore made that an interview with a serious game designer provides the input for the non functional requirements. The interview (see Appendix A) provided two types of non functional requirements; constraints and quality requirements. Constraints set limitations on how the requirements are met whereas quality requirements define what characteristics increase the quality of the method (Robertson, 2001).

Constraints

The constraints on the culture driven game design method were mainly limiting the amount of resources spent on applying it.

The amount of time needed to apply the method should be minimized.

- B.1 The amount of time needed by the serious game designer to apply the method should be minimized.
- B.2 The amount of time needed for the client of the serious game designer to provide input should be minimized.

The amount of budget needed to apply the method should be minimized.

- B.3 The costs to apply the method should be minimized.

The amount of effort needed to apply the method should be minimized

B.4 It should be possible to apply the method without any knowledge on cultural theory.

Quality requirements

The quality requirements on the culture driven game design method focus on the desired output.

C.1 The method should provide an overview of the culture of the players.

C.2 The method should provide an overview of the critical factors.

C.3 The method should provide suggestions how to deal with the identified factors.

3.3 Conclusions

In chapter 2 the system analysis has been conducted. It was concluded that although the players' culture is relevant for the success of the game, none of the existing serious game design methods supports the designers in adapting their games to the culture of the players. This research proceeds with the design of the culture driven game design method; a serious game design method that is able to adapt serious games to the players' culture. In this chapter the design space for the design of the culture driven game design method was set.

The first act in setting the design space was the selection of an existing serious game design method to function as the foundation for the culture driven game design method. An existing method was selected because it is a proven serious game design method with an overlap in function with the culture driven game design method. From the analyzed serious game design methods in chapter 2 the Triadic Game Design development method was selected because it is an agile design method which is applicable to both analogue and digital serious games. An agile method was preferred over a waterfall method because agile methods, like other soft systems methods, are able to cope with the socio-political complexity of complex multi actor systems.

The second act in setting the design space was listing the requirements of the culture driven game design method. These requirements functioned as guidelines during the design process of the culture driven game design method described in chapter 4 and were used as structure for the evaluation in chapter 5.

CHAPTER 4 – DESIGNING THE CULTURE DRIVEN GAME DESIGN METHOD

In the previous chapter the design space was defined. In this chapter this design space is explored and the culture driven game design method is designed. As discussed in section 1.4 regarding the research method, the design process of the culture driven game design method consists of multiple iterations. This chapter presents the results of the last iteration conducted.

This chapter is structured according to the steps in the culture driven game design method. In chapter 4.1 the framework of the culture driven game design method is described. Next the three steps of the culture driven game design method are described in sections 4.2 to 4.4. In section 4.5 the culture driven game design method is placed into the context of the Triadic Game Design development model. Section 4.6 presents the conclusions.

4.1 Framework of the culture driven game design method

In chapter 3 the Triadic Game Design development model was selected to function as the foundation of the culture driven game design method. The TGDdm is an iterative method that follows a design-test-evaluate pattern. Each iteration delivers a new, improved version of the game which functions as an input for the next iteration. During these iterations playtesters are used to test the game. This pattern is schematically shown in figure 9.

As discussed in the problem introduction, game designers are able to adjust their serious games to the culture of the targeted players by means of playtesting the game with them. This is done by replacing the playtesters with the targeted group of players during one or more playtest sessions. The results from these sessions are then used to adapt the game to the players' culture. However, due to a lack of time, high costs and the need for a good first impression, playtesting is not always possible.

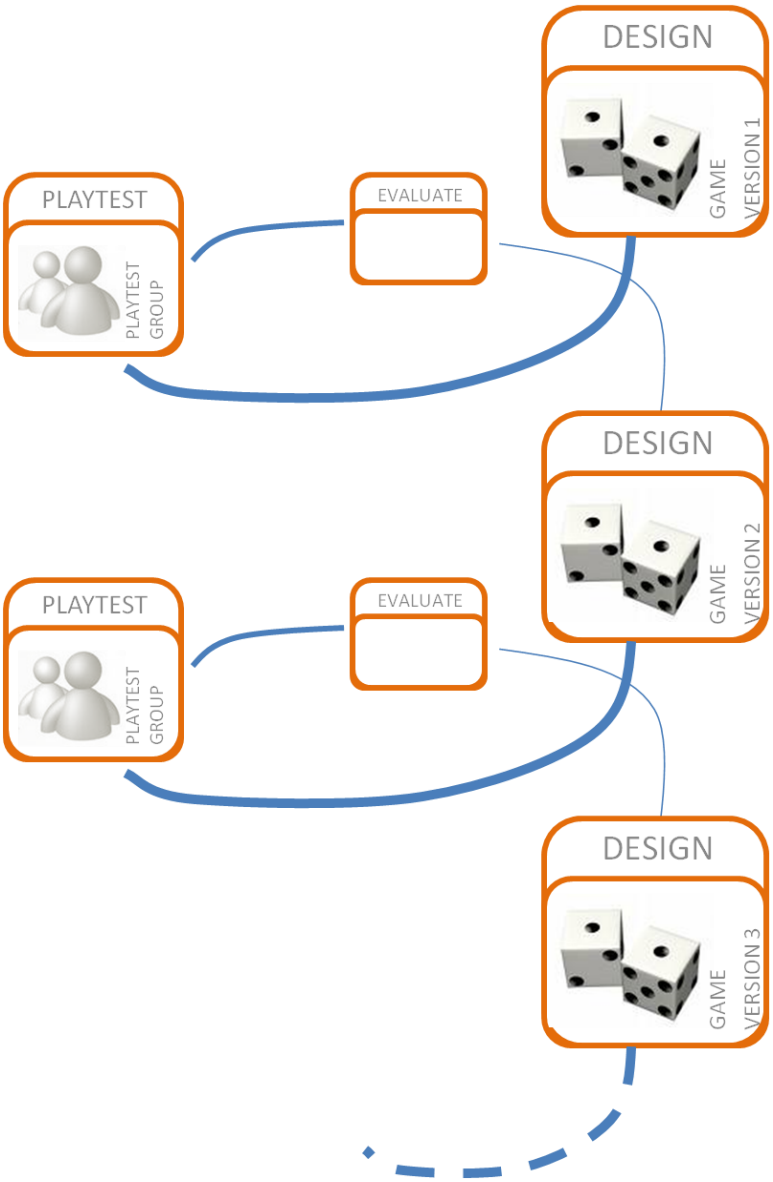

Figure 9 – Schematic design-test-evaluate pattern

The culture driven game design method avoids this by adding an extra design iteration to the TGDdm, named the culture driven game design iteration. This iteration is depicted in figure 10.

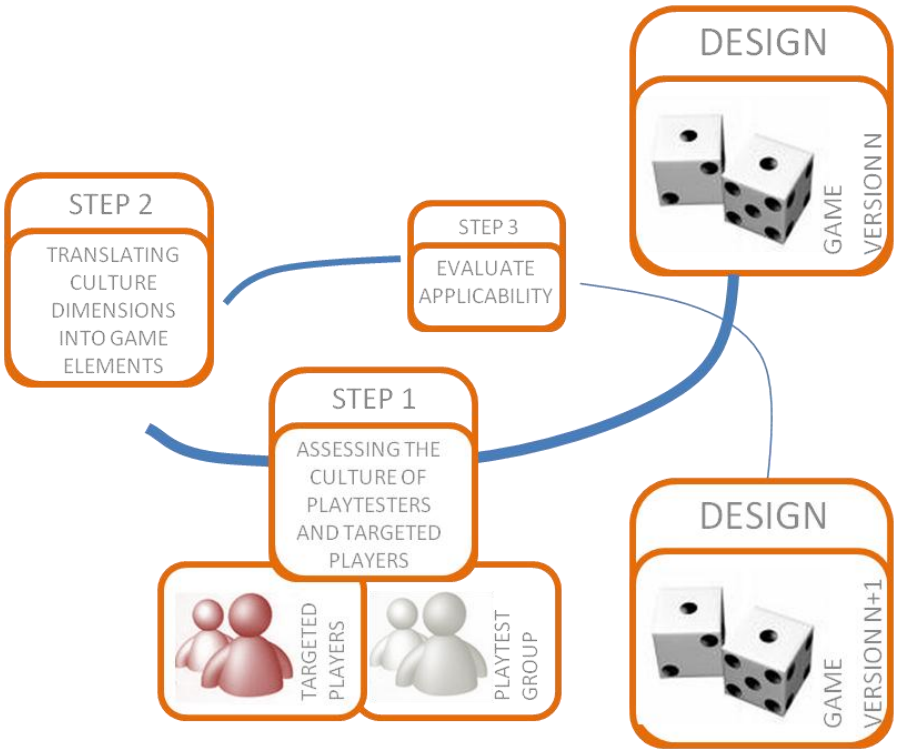

Figure 10 – The culture driven game design iteration

The culture driven game design iteration consists of three steps. The current version of the game, version N, was developed through multiple iterations of playtesting using playtesters. Throughout this process the game was adapted to the culture of these playtesters. In order to adapt the current version of the game to the culture of the targeted players, the difference in culture between the targeted players and the playtesters needs to be known. It is therefore that in step 1 the culture difference between the targeted players and the playtesters is assessed. The outcome of this assessment is presented along the 5 culture dimensions of Hofstede. In step 2 of the culture driven game design iteration the culture difference is linked to the choices regarding game elements a game designer needs to make during the design process. In the step 3 the applicability of the suggested game elements is determined.

In the following three sections the design choices for each step are discussed. At the end of each section it is explained how the method is to be applied. The discussion of the design choices and the explanation of the method result in redundant descriptions. However, this structure was preferred to a method description stuffed with references to other sections.

4.2 Step 1 – Assessing the culture of the players

In the first step of the culture driven game design iteration the culture of the targeted players and the playtesters is assessed. In subsection 4.2.1 three methods were considered that can be used for a culture assessment; historic data, observations and surveys. After the selection of surveys as the method, a proven theory was needed to provide the content and structure of the survey. Three of the main theories in this field of discipline are discussed, the theories of Schein, Cooke and Hofstede, followed by the selection of the theory of Hofstede to be used. The selection of a method for the culture assessment of the players and the selection of a theory to provide the content and structure

of the survey, are based on the requirements defined in chapter 3. However, not all requirements of the culture driven game design method were relevant for the first step in which the culture of the players is assessed. The following requirements proved to be relevant in the development of the first step of the culture driven game design iteration:

A.2 The method must be applicable to all types of cultures.
B.1 The amount of time needed by the serious game designer to apply the method should be minimized.
B.2 The amount of time needed for the client of the serious game designer should be minimized.
B.3 The costs to apply the method should be minimized.
B.4 It should be possible to apply the method without any knowledge on cultural theory.
C.1 The method should provide an overview of the culture of the players.

After the selection of the Hofstede's theory a reply is given to the critique to this theory in subsection 4.2.2. The final subsection (4.2.3) describes how the theory of Hofstede is applied in the first step of the culture driven game design iteration.

4.2.1 Selection of culture assessment theory

In the first step of the culture driven game design iteration the culture of the targeted players and the playtesters is assessed. There are three ways to assess culture: use historical data, use observations or use surveys.

- Historical data – To use historical data documented results are needed of earlier culture assessments of the specific group of targeted players. It is highly doubtful that these documented results are available and recent enough to be accurate. Thereby the problem rises that the format of the historical data is uncontrolled. This makes it hard to translate this data into game elements in the second step of the culture driven game design iteration. It is therefore that the possibility of using historical data to assess the culture of the targeted players is excluded.
- Observations – There are two settings in which observations can be made; (1) while the players engage in a carefully thought out experiment, (2) while the players engage their normal daily activities. The first setting is disregarded as a method to assess the culture of the players based on requirement B.1: The amount of time needed by the serious game designer to apply the method should be minimized and requirement B.2: The amount of time needed for the client of the serious game designer should be minimized. A separate experiment to assess the culture of the players requires more time of both the players and the game designer than the use of surveys. In the second setting there is less time required of the players since the observations are done during the daily activities of the players. But to assess the culture of the players trough observations in an uncontrolled environment, requires specific skills of the observer. Therefore, the second setting is disregarded based on requirement B.4: It should be possible to apply the method without any knowledge on cultural theory.
- Surveys – As the use of historical data and observations are disqualified, surveys are used as the way to assess the culture of the players. Surveys are an economic way of gathering data. They require a minimum input of the game designer and only a small effort of the players. Because the survey is standardized the game designer does not need to have any specific culture assessment skills. The final convenient characteristic of surveys is that they provide a standardized outcome of the culture assessment which simplifies the processing of this outcome in the second step of the culture driven game design iteration.

Now surveys are selected as the method to assess the culture of the players, a proven theory was needed to provide the content and structure of the survey. In this subsection three of the main theories in this field of discipline will be discussed, the theories of (Schein, 2004), (Cooke & Rousseau,

1988) and (Hofstede, 1980, 2001). Each theory on culture is briefly described here, after which the selection of a theory is discussed.

Schein

Schein's organizational model, as described in (Schein, 2004) explains culture from the stand point of the observer, described by three cognitive levels of organizational cultures.

- Level 1 – Organizational attributes – The first level consists of visible artefacts like facilities, offices, furniture, dresscodes and visible interaction between employees and between emplotees and organizational outsiders but also slogans, mission statements and other operational creeds.
- Level 2 – Professed culture – The second level consists of the values of the organizations members. Behaviour at this level usually can be studied by interviewing members of the organization.
- Level 3 – The organizations deepest assumptions – The cultural elements at this level are unseen and not cognitively identified in everyday interactions. They are often a taboo to discuss inside the organization.

Cooke

Cooke's theory (Cooke & Rousseau, 1988) on organizational culture involves the organizational culture inventory which measures 12 behavioural of norms that are grouped into three types of culture. The three types are constructive cultures, passive / defensive cultures and aggressive / defensive cultures:

- Constructive cultures – Members of this culture interact with others in a way that will help them meet their higher-order satisfaction needs.
- Passive / defensive cultures – Members of this culture interact with others in a way that will not threaten their own security.
- Aggressive / defensive cultures – Members of this culture interact with others in a forceful way to protect their status and security.

Hofstede

Hofstede argues that by knowing the nationality of someone's parents a good prediction can be made of the basic values regarding social life acquired by the participants (Hofstede, 1980, 2001; G. J. Hofstede, 2008). These basic values can be organized along five basic dimensions of social life; identity, power distance, gender, fear of the unknown, gratification of needs. A short description of these five basic dimensions adapted from (Hofstede, 2001):

- *Power distance* – This dimension runs from egalitarian (small power distance) to hierarchical (large power distance) societies. It is the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally.
- *Identity* – This dimension runs from collectivistic to individualistic societies. In individualistic societies a person is expected to look after himself or herself and his or her immediate family only. This in contrast with the collectivistic societies in which people from birth onwards are integrated into strong, cohesive in-groups, which continue to protect them throughout their lifetime in exchange for unquestioning loyalty.
- *Gender* – This dimension runs from feminine, 'sit and talk' societies to masculine, 'stand and fight' societies. Masculine societies have clearly distinct social gender roles; men have to be assertive, tough and focused on material success. Women are supposed to be more modest, tender and concerned with the quality of life. In feminine societies these social gender roles overlap: both women and men are supposed to be modest, tender and concerned with the quality of life.

- *Fear of the unknown* – This dimension opposes uncertainty-tolerant, novelty seeking cultures to uncertainty-avoiding, strangeness-fearing ones. In uncertainty avoiding cultures members of institutions and organizations within a society feel threatened by uncertain, unknown, ambiguous or unstructured situations.
- *Gratification of needs* – This dimension contrasts short-term oriented cultures to long-term oriented ones. A long term orientation stands for a society which values virtues oriented towards future rewards, in particular adaptation, perseverance and thrift. Short term orientation stands for a society which fosters virtues related to the past and present in particular respect for tradition, preservation of 'face' and fulfilling social obligations.

Selection of theory

Examining the three theories on culture it is concluded that all three theories are able to provide an overview of the culture of the players (requirement C.1) without excluding any type of culture (requirement A.2). Another similarity is that all of the three theories only require standard office software and man hours of the game designer which minimizes the costs of applying the method (requirement B.3). However, after close examination of the three theories on culture, the theory of Hofstede was selected for the development of the culture driven game design iteration. The main argument for this selection was that the theory of Hofstede also provides a questionnaire (G. H. Hofstede, 2008) that was used to assess the culture of 117.000 respondents (Hofstede, 1980). Hofstede therefore provides a proven and more tangible tool to assess the culture in comparison with the other theories in which the assessment of the culture will take a lot of time. As stated in requirements B.1 and B.2 in the previous chapter, the use of time should be minimized. Next to that, the theory of Hofstede is relatively easy to understand and to use. The questionnaire consists of 20 questions and provides a structured output on five dimensions. This addresses requirement B.4, that it should be possible to apply the method without any knowledge on cultural theory.

4.2.2 Critique on culture assessment theory of Hofstede

The work of Hofstede (and Hofstede) received a lot of critique (see for instance: (Bhimani, 1999; Harrison & McKinnon, 1999; McSweeney, 2002; Redding, 1994)). Hofstede replied to this critique in an article by clustering and answering the critics in five points. A summary from (Hofstede, 2002):

1. *Surveys are not a suitable way of measuring cultural differences (Hofstede´s answer: Surveys should not be the only way).*
2. *Nations are not the best units for studying cultures (Hofstede´s answer: True, but nations are usually the only kind of units available for comparison and better than nothing).*
3. *A study of the subsidiaries of one company cannot provide information about entire national cultures (Hofstede´s answer: What was measured were differences between national cultures. Any set of functionally equivalent samples from national populations can supply information about such differences. The IBM set consisted of unusually well matched samples for an unusually large number of countries. The extensive validation in the following chapters will show that the country scores obtained correlated highly with all kinds of other data, including results obtained from representative samples of entire national populations).*
4. *The IBM data are old and therefore obsolete (Hofstede´s answer: The dimensions found are assumed to have centuries-old roots; only data which remained stable across two subsequent surveys were maintained; and they have since been validated against all kinds of external measurements; recent replications show no loss of validity).*
5. *Four or five dimensions are not enough (Hofstede´s answer: Additional dimensions should be both conceptually and statistically independent from the five dimensions already defined and they should be validated by significant correlations with conceptually related external measures; candidates are welcome to apply).*

During the design it became apparent that not the complete theory of Hofstede would be used. In the culture driven game design iteration the culture dimensions that Hofstede defined are used including the attached questionnaire that assesses the values on the different dimensions for a particular group of people. The concept of national cultures is disregarded. Because of this design choice three out of the five points of critique do not apply to the culture driven game design iteration; nations are not used as the unit for studying culture (point of critique 2), neither are the results of the IBM data used (point of critique 3 and 4). Points of critique that remain regard the suitability of the use of surveys and the amount of dimensions. A short reply to this remaining critique is given here, before explaining how the theory on culture dimensions is applied in the culture driven game design iteration in the next subsection.

The first remaining point of critique is that surveys are not a suitable way of measuring cultural differences. Without addressing to the issue of suitability Hofstede replies to this critique by stating that the majority of the social scientists make use of survey- and test-based cross-cultural studies in their work, including the studies that are referred to by the critics (Hofstede, 2002). Although it may not answer the critique straight forward it does touch the issue that explains the use of surveys; there are no other techniques for assessing culture that match results with the limited amount of effort needed. Since this amount of effort is also one of the requirements for the culture driven game design method the stated critique is accepted knowing that the majority of the cross-cultural studies rely on this technique.

The second remaining point of critique is that four or five dimensions are not enough. In a reply Hofstede states that candidates are welcome if conceptually and statistically independent from the incumbent dimensions (Hofstede, 2002). But until that time the amount of culture dimensions remains at five as they are described in (Hofstede, 2001; Hofstede & Hofstede, 2005). These are the culture dimensions that are used in this research. It should however be noted that Hofstede put his words to action in the revised publication of his questionnaire in (Hofstede, Hofstede, Minkov, & Vinken, 2008). In this questionnaire two new dimensions have been added by means of experiment based on the work of (Minkov, 2007). Results of this experiment were at the time this research was published unknown.

4.2.3 Assessing the culture of the players

Now the culture assessment theory is selected and its critiques are discussed, this subsection describes how the theory is applied in the first step of the culture driven game design iteration. The goal of this first step is to assess the culture difference between the targeted players and the playtesters, so that in the end the current version of the game can be adapted for this culture difference. Figure 11 depicts the position of the first step in the culture driven game design iteration.

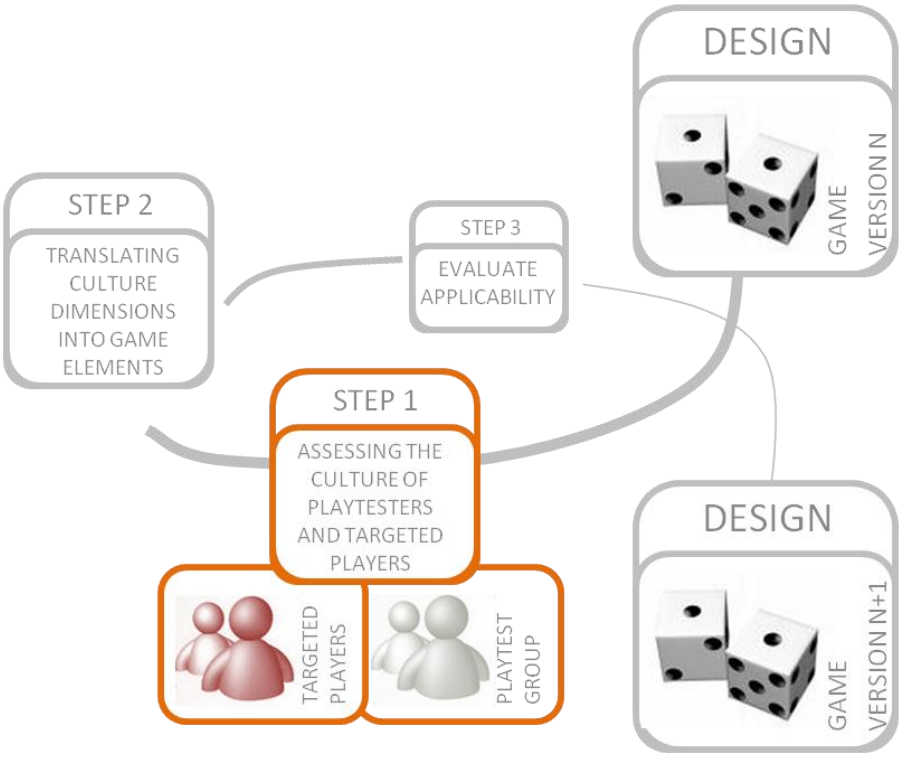

Figure 11 – Step 1 in the culture driven game design iteration

The current version of the game, version N in figure 11, was developed through multiple iterations of playtesting using playtesters. Throughout this process the game was adapted to the culture of the playtesters. In order to adapt the current version of the game to the culture of the targeted players, the difference in culture between the targeted players and the playtesters needs to be known. It is therefore that in step 1 the culture difference between the targeted players and the playtesters is assessed. Step 1 of the culture driven game design iteration consists of three acts as depicted in figure 12.

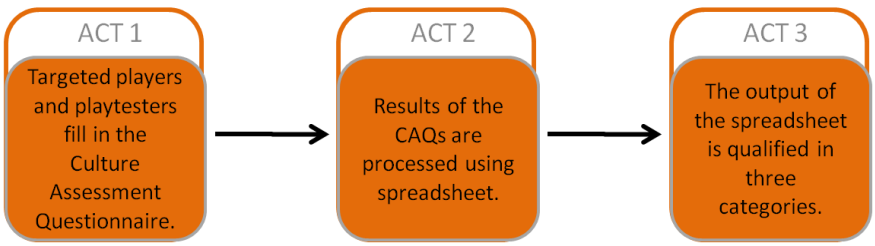

Figure 12 – The three acts in step 1 of the culture driven game design iteration

In the first act of step 1 of the culture driven game design iteration both the playtesters and the targeted players are requested to fill in the Culture Assessment Questionnaire (CAQ). The CAQ is an adapted questionnaire of the one Hofstede provides (G. H. Hofstede, 2008) which can be found in Appendix B.

In the second act of step 1, the results of the Culture Assessment Questionnaires are filled into a spreadsheet. This spreadsheet can be found on the CD attached to the back of this report. The spreadsheet contains the formulas for the calculation of the values on the different culture dimensions as given in (Hofstede, et al., 2008). In the spreadsheet a difference can be made between the results of the targeted players and the playtesters. The output of the spreadsheet is the table with the values on the different culture dimensions for both groups including a column with the absolute difference between the groups. An example table is shown in table 4.

Table 4 – Example output of step 1 of the culture driven game design iteration

	PLAYERS	PLAYTESTERS	DIFFERENCE
POWER DISTANCE	19	4	15
IDENTITY	6	96	90
GENDER	53	-35	88
FEAR FOR THE UNKNOWN	-62	-106	44
GRATIFICATION OFNEEDS	38	41	3

The third and final act of the first step of the culture driven game design iteration is the interpretation of the output of the spreadsheet. For this interpretation only the third column of the table is regarded. Hofstede calibrated the formulas such that the absolute difference between the targeted players and playtesters lies in the range of 0 – 100 for each dimension. This means that a theoretical difference of 100 between the players and the testplayers on a single dimension is the maximum possible difference. A theoretical difference of 0 means that the players' culture and the testplayers' culture do not differ. On this scale three levels of difference were defined.

Table 5 – Levels of culture difference

LEVEL	DIFFERENCE
LOW	0 – 33
MEDIUM	34 – 66
HIGH	67 – 100

The values determining the level of difference in table 5 were chosen arbitrary. The influence of these arbitrary chosen values is limited since it is only used as an indication of the need to adjust the game for this difference in culture between the playtesters and the targeted players. In the end, step 3 to be exact, it is the game designer who determines if the game is adjusted or not.

Having interpreted the output of the spreadsheet, the first step of the culture driven game design iteration is completed. In the next step the culture differences on the culture dimension are translated to game elements.

4.3 Step 2 – Translating culture dimensions into game elements

The first step of the culture driven game design iteration provided an assessment of the culture differences for which the game still needs to be corrected. The outcome of this assessment is presented along the 5 culture dimensions of Hofstede. In the second step of the culture driven game design iteration the culture dimensions are linked to choices regarding game elements a game designer needs to make during the design process. By linking the culture difference to the choices regarding game elements the method is able to actively support the game designer in adapting the game to the players' culture. In 13 step 2 in the culture driven game design iteration is depicted.

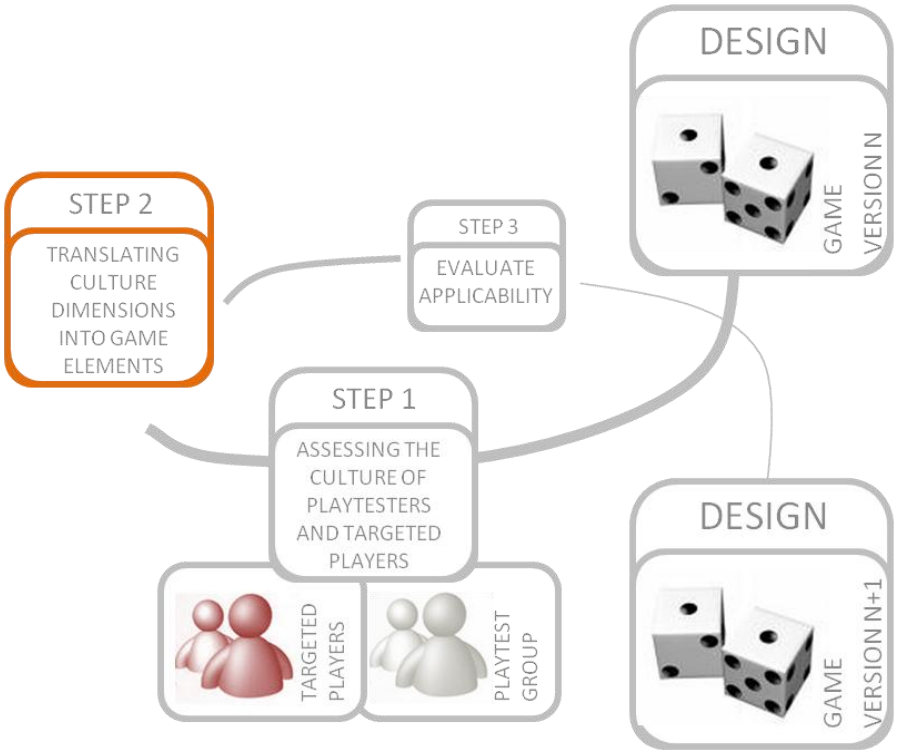

Figure 13 – Step 2 in the culture driven game design iteration

To structure this translation a theory was needed that provides an overview of the choices regarding game elements a game designer needs to make. In subsection 4.3.1 a long list is presented of game element theories and taxonomies that were considered. This long list was reduced to a short list of three theories. These theories are discussed in more detail in subsection 4.3.2. In the same subsection the model of (Wenzler, 2008) of game dimensions is selected to function as the structure for the translation of the culture dimensions of Hofstede to suggestions for game design. The crossing of the culture dimensions with the game dimensions is described in subsection 4.3.3. The application of the second step of the culture driven game design method is described in subsection 4.3.4.

4.3.1 Long list of game element theories

Since the Triadic Game Design development method is used as the foundation for the culture driven game design method, the first eyes in the search for a game element theory or taxonomy were pointed at the Triadic Game Design philosophy. Harteveld explained game elements as the building blocks of games that need to be aligned using rules in providing the participants a gaming experience (Harteveld, 2010). Despite using game elements throughout the theory of Triadic Game Design, Harteveld does not provide a taxonomy or overview of these building blocks.

Because of this lacuna in the Triadic Game Design philosophy six game element theories and taxonomies were considered in the search for a theory that provides an overview of the choices a serious game designer needs to make;

- The serious game taxonomy of Sawyer and Smith
- The Game Design Basics of Fullerton
- The taxonomy of computer games of Crawford
- The game components of Duke
- The views of Salen and Zimmerman
- The game dimensions of Wenzler

In the process of downscaling this long list to the short list the following criterion was used; the game element theory or taxonomy should not be limited to digital games. This criterion was derived from requirement A.1 of the culture driven game design method; the method must be applicable to all types of serious games. The theories and game element taxonomies that did not match this criteria are discussed briefly:

The serious game taxonomy – Sawyer and Smith
The serious game taxonomy of Sawyer and Smith crosses the objectives of serious games with the organizations in which games are used. This taxonomy does not provide an overview of the design choices a serious game designer needs to make. Thereby Sawyer and Smith constrain their theories to digital games. They claim that analogue games are outdated (Sawyer & Smith, 2008).

Game Design Basics – Fullerton
The serious game design method of Fullerton, the playcentric approach, was discussed in section 3.5. As a basis of the playcentric approach Fullerton defined several 'Game Design Basics'. Fullerton described the role of the game designer, the structure of games, system dynamics, formal and dramatic elements (Fullerton, 2008). However, the game design basics hardly include social interaction as one of the game elements. This is a critical miss since social interaction is one of the premises for frustration by culture related behaviour. (See section 1.2) Next to this, the Game Design Basics focus on elements of digital games. Consistent with the playcentric approach the game design basics concentrate on digital games. As the culture driven game design method targets both analog and digital games this disqualifies the game design basics as a theory to be used as game element taxonomy.

The taxonomy of computer games – Crawford
The serious game design method of Crawford, the game design sequence, was discussed in section 3.4. Along with the game design sequence, Crawford presents the taxonomy of computer games (Crawford, 1984). It is argued that a great deal can be learned about game design from this taxonomy since it illuminates the common factors as well as the critical differences between families of games. These characteristics provide an overview of some of the choices a serious game designer needs to make. However, along with the game design sequence, this taxonomy is limited to digital games and was therefore not be used.

Since three game element theories or taxonomies did not meet the criterion of not being limited to digital games, the short list consists of three methods;

- The game components of Duke
- The views of Salen and Zimmerman
- The game dimensions of Wenzler

4.3.2 Selection of game element theory

The selection of the game element theory or taxonomy from this shortlist was based on the requirements of the culture driven game design method that apply to the second step;

A.4 The method must produce output that supports the serious game designer in adapting the serious game to the players' culture.

B.1 The amount of time needed by the serious game designer to apply the method should be minimized.

B.3 The costs to apply the method should be minimized.

Before selecting the game element theory or taxonomy the three remaining theories are briefly introduced.

The views – Salen & Zimmerman

In the book 'Rules of Play' an attempt is made to frame and organize the knowledge on games (Salen & Zimmerman, 2004). Salen and Zimmerman do this by organizing the varied points of view according three primary schemas; rules, play and culture.

- Rules are the organization of the designed system
- Play is the human experience of that system
- Culture is the larger contexts engaged with and inhabited by the system.

The views within the schemas of rules and play can provide the designer with an overview of game elements. All these views are extensively discussed in the 600+ page book. Despite this, Salen and Zimmerman conclude that 'there are many concepts we didn't mention in the course of these analyses. But a comprehensive overview was not the intention of our review.' (Salen & Zimmerman, 2004, pg. 585)

The Game Components – Duke

Duke presents a game element taxonomy named the Game Components (Duke, 1974), see figure 14.

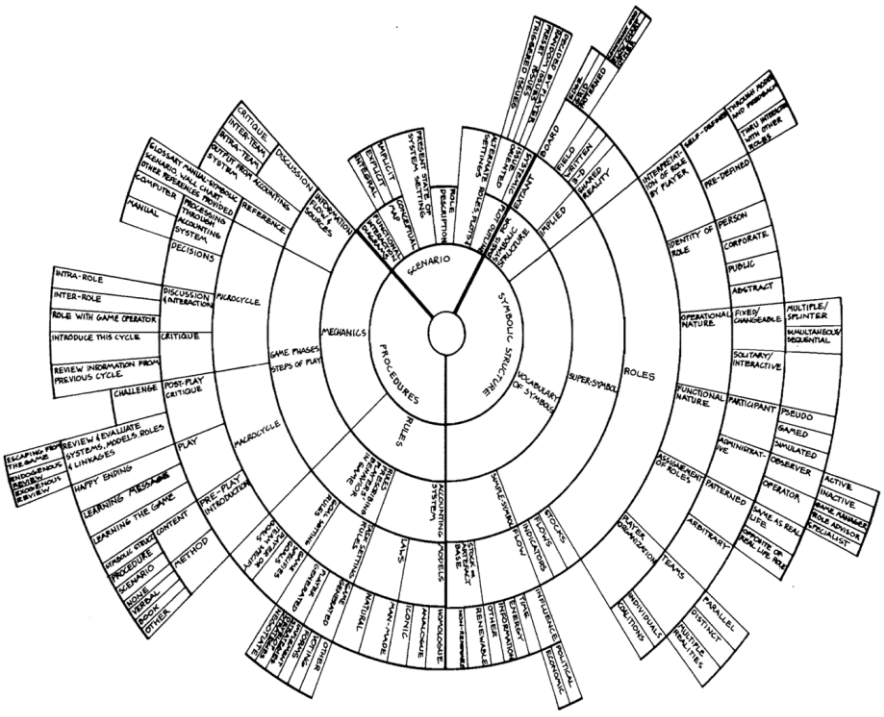

Figure 14 – The Game Components of Duke (1974)

According to Duke the Game Components form a standard set of conventions employed in game design. The Game Components are presented under three headings: symbolic structure, procedures and scenarios.

- The symbolic structure is the game-specific language described as a set of symbols and rules governing their use. These symbols may vary from a board with pawns to coalitions in player roles.
- Procedures is the overarching term for the rules and mechanics of the game. Rules are conditions in the game that cannot be changed. Mechanics of the game are conditions that can be changed or need to be formed in the game like the interaction patterns between the players.
- Scenarios is the overarching term for techniques conveying the 'story' or plot. These techniques vary from systematic plot outlines and role descriptions to the use of implicit conceptual maps.

The game dimensions – Wenzler

In the book *Why do games work? In search of the active substance* several researchers and gaming professionals are asked for their view on the active substance of gaming (Caluwé, et al., 2008). Ivo Wenzler views the active substance 'as something at a more structural level, like a genetic code' (Wenzler, 2008, pg. 43). This genetic code is build up out of elements that make the game. This structure is briefly described here, for a more elaborate description see (Wenzler, 2008, pg. 41-49).

Wenzler first defined four basic components that each simulation game has. Each component is made up of four dimensions, representing the game structure. Each of these sixteen dimensions is then further defined into a range of possible states. This is depicted in figure 15.

Components	Dimensions	Range of characteristics (mutations) for each dimnsion	
A. Context	Problem	understood	ambiguous
	Objective	knowledge transfer	knowledge creation
	Model	qualitative	quantitative
	Story	reality based	metaphor based
B. Players	Target	single individual	multiple groups
	Level	operational	executive
	Roles	own (real-life)	somebody else's (assumed)
	Culture	homogeneous	heterogeneous
C. Process	Sequence	real time	concentrated
	Interaction	directive	self organizing
	Steps	sequential	iterative
	Indicators	qualitative	quantitative
D. Environment	Location	single	multiple
	Place	physical	virtual (IT-based)
	Material	static	evolving (transformable)
	Representation	realistic	symbolic

Figure 15 – The game dimensions of Wenzler (2008)

Using the dimensions and the possible states, Wenzler intended to represent the complexity of the choices that designers make in a simple manner. Wenzler concludes that the level of complexity in developing the game increases when moving to the states displayed at the right side of the model.

Selection of game element taxonomy

As stated at the beginning of this subsection the selection of the game element theory was based on 3 requirements.

- A.4 The method must produce output that supports the serious game designer in adapting the serious game to the players' culture.
- B.1 The amount of time needed by the serious game designer to apply the method should be minimized.
- B.3 The costs to apply the method should be minimized.

All of the three theories only require standard office software and man hours of the game designer which minimizes the costs of applying the method (requirement B.3). With requirement B.3 satisfied, a classic trade-off appears between the functionality of the output and the time needed to produce this output. Regarding the functionality of the output, one of the similarities of the three game element theories is that they all include social interaction as part of the choices a game designer needs to make. As discussed earlier, social interaction is a catalyst of culture related behaviour. Salen and Zimmerman defined multiple views which relate to social interaction (Salen & Zimmerman, 2004), Duke included a variety of game components that enable social interaction (Duke, 1974) and Wenzler dedicated several dimensions to choices related to social interaction (Wenzler, 2008).

Another similarity regarding the functionality of the output is that none of the authors claim their theory to be conclusive. Although each author picks his words; 'there are many concepts we did not mention' (Salen & Zimmerman, 2004), 'this can be viewed as a manual of style, not so much a definitive structure' (Duke, 1974) or 'I do not claim the truth, the whole truth and nothing but the truth' (Wenzler, 2008) but the message remains the same; there is no conclusive overview of the set of possible game elements, so neither is the set presented.

Despite these similarities the amount of detail provided by each game element theory differs a lot. Salen and Zimmerman define and elaborately discuss their 17 views on games, using a lot of inspiring examples. Duke on the contrary, remains at a rather theoretical level. The 16 dimensions in the model of Wenzler are briefly described. An advantage of a large amount of detail is that the game designer receives more support in adapting the game. However, a large amount of detail also increases the amount of time needed by the game designer to apply the method. In this trade off the model of Wenzler has been selected.

Wenzler's model provides a well described and comprehensive overview of the choices a game designer needs to make. Thereby the granularity of Wenzler's model matches with the culture dimensions of Hofstede. Both provide a limited set of dimensions ranging from the one extreme to the other. This in contrast with the views of Salen and Zimmerman which have a more broader description which makes it more difficult to link these views to the culture dimensions. This leads to the conclusion that the model of Wenzler provides a preferable structure to which the culture dimensions of Hofstede are crossed.

4.3.3 Crossing game element theory with the culture dimensions

In the previous subsection the game element theory of Wenzler was selected to provide a structured overview of the choices a game designer needs to make. In this subsection the 16 game dimensions of Wenzler's model are crossed with the Hofstede's five culture dimensions. Each game dimension has 2 extremes. For instance the game dimension 'player roles' runs from real life roles to assumed roles. Each culture dimension also has 2 extremes. For instance the power distance dimension runs from egalitarian to hierarchical cultures. This results in the Cross Dimensional Matrix as displayed in figure 16.

				CULTURE DIMENSIONS									
				POWER DISTANCE		IDENTITY		GENDER		FEAR OF THE UNKNOWN		GRATIFICATION OF NEEDS	
				Egalitarian	Hierarchical	Collectivistic	Individualistic	Femenine	Masculine	Uncertainty tolerant	Uncertainty avoiding	Short term oriented	Long term oriented
GAME DIMENSIONS	CONTEXT	PROBLEM	Understood										
			Ambiguous										
		OBJECTIVE	Knowledge transfer										
			Knowledge creation										
		MODEL	Qualitative										
			Quantitative										
		STORY	Reality based										
			Metaphor based										
	PARTICIPANTS	TARGET	Single-individual										
			Multiple groups										
		LEVEL	Operational										
			Executive										
		ROLES	Real life										
			Assumed										
		CULTURE	Homogeneous										
			Heterogeneous										
	PROCESS	SEQUENCE	Real time										
			Concentrated										
		INTERACTION	Directive										
			Self organizing										
		STEPS	Sequential										
			Iterative										
		INDICATORS	Qualitative										
			Quantitative										
	ENVIRON-MENT	LOCATION	Single										
			Multiple										
		PLACE	Physical facility										
			Virtual environment										
		MATERIAL	Static										
			Evolving										
		REPRESENTATION	Realistic										
			Symbolic										

Figure 16 – The Cross Dimensional Matrix

Each cell of the Cross Dimensional Matrix stands for a potential conflict between the players' culture and a game element. So for each cell it was examined if the combination of the specific culture collides with the extreme on the game dimension. This examination resulted in a classification of each cell in three possible states. The classification is as following:

- White – It cannot be deducted from theory neither is there an expectation that a high difference on the culture dimension collides with the extreme on the game dimension.
- Red – It can be deducted from theory that a high difference on the culture dimension collides with the extreme on the game dimension.
- Orange – Using a verifiable assumption it can be deducted from theory that a high difference on the culture dimension collides with the extreme on the game dimension.

As shown in figure 16, 26 cells are classified as red. One cell is classified as orange and the other 293 cells are classified as white. The cells classified as red or orange are discussed in Appendix C. As a representative example the description is given here of the potential conflict at the crossing of the identity dimension with the target dimension.

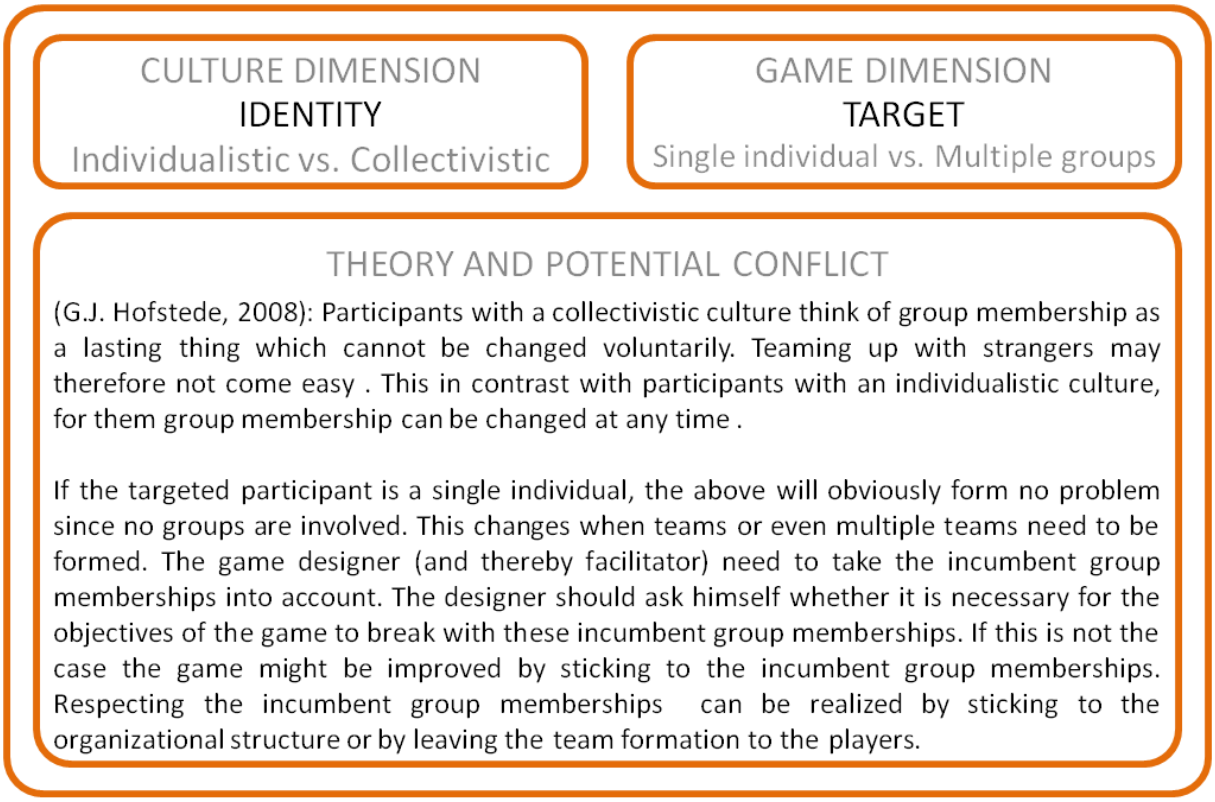

Figure 17 – Description of the potential conflict between Identity and Target

As shown in figure 17, the description of potential conflicts is clustered by the dimensions. This figure shows the crossing of the culture dimension *identity* with the game dimension *target*. First, a relevant explanation is given of the ways in which the culture dimensions affect the willingness to engage in gaming provided by (G. J. Hofstede, 2008). This theory forms the final stepping stone towards the translation to the game dimension. In the next step the consequences of this willingness to engage in gaming for the specific game dimension are reasoned. Where possible, the description is completed with a suggestion how to mitigate this potential conflict.

It is acknowledged that a relatively small amount of literature was available for providing the theory that forms the final stepping stone in the translation towards game dimensions. The reason for this lacuna in the theory available is probably similar to the reason why the number of game design methods is limited. Serious game design is compared to other design sciences a young discipline (Mayer, 2010; Salen & Zimmerman, 2004). Further research in the field of the influence of culture in games is necessary to improve this translation from culture dimensions to game dimensions. This research may well provide the first step. This discussion is elaborated upon in chapter 7 - Discussion and reflection.

4.3.4 Translating culture dimensions into game elements

In the previous subsection the culture dimensions have been crossed with the game dimensions. This Cross Dimensional Matrix forms the body of the second step of the culture driven game design iteration. In this subsection this second step is fully described. In figure 18 the position of step 2 in the culture driven game design iteration is shown.

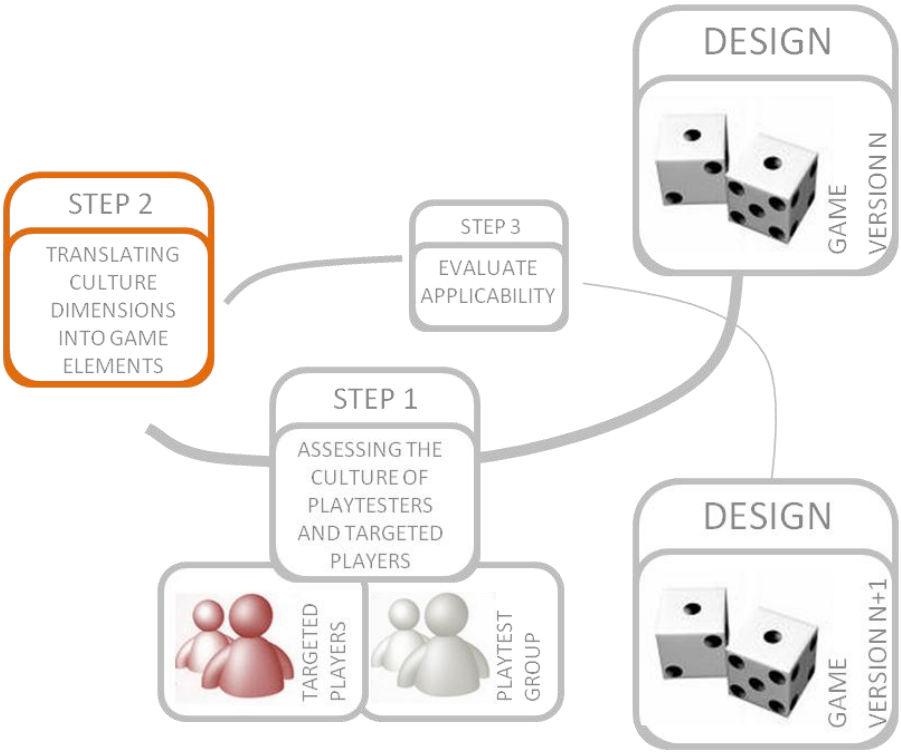

Figure 18 – Step 2 in the culture driven game design iteration

As stated in the previous section, game version N was made using playtesters. In step 1 the culture of the playtesters and the targeted participants was assessed. The game needs to be adapted to the difference in culture between these two groups. This difference is shown in the output table of step 1. An example of such an output table is shown in table 6.

Table 6 – Example output of step 1 of the culture driven game design iteration

	PLAYERS	PLAYTESTERS	DIFFERENCE	DIFF. LEVEL
POWER DISTANCE	19	4	15	LOW
IDENTITY	6	96	90	HIGH
GENDER	53	-35	88	HIGH
FEAR FOR THE UNKNOWN	-62	-106	48	MEDIUM
GRATIFICATION OFNEEDS	38	41	6	LOW

The difference levels indicate the amount of difference between the players and the playtesters. If the difference on a particular culture dimension is labelled as low, the game does not need to be adapted for this difference. As described in subsection 4.2.3, this need to adapt the game increases with a rising level of difference.

In step 2 of the culture driven game design iteration the difference levels from the output of step 1 are transferred to the Cross Dimensional Matrix. For the culture dimensions which have a difference level of medium or high also the classification of the players on that particular culture dimension is transferred. In the output shown in table 6 the players have a far higher score on the gender dimension than the playtesters. A higher score for the players on a culture dimension corresponds with the culture dimension extreme on the right in the Cross Dimension Matrix. Consequently, if the players have a lower score on a culture dimension, this corresponds with the culture dimension on the left in the Cross Dimensional Matrix. For the presented example it means that the players have a far more masculine culture than the playtesters. Using the colours red for a high difference level, yellow for a medium difference level and green for a low difference level, the transfer of the output of step 1 to the Cross Dimensional Matrix provides the following result:

				CULTURE DIMENSIONS									
				POWER DISTANCE		IDENTITY		GENDER		FEAR OF THE UNKNOWN		GRATIFICATION OF NEEDS	
				Egalitarian	Hierarchical	Collectivistic	Individualistic	Femenine	Masculine	Uncertainty tolerant	Uncertainty avoiding	Short term oriented	Long term oriented
GAME DIMENSIONS	CONTEXT	PROBLEM	Understood										
			Ambiguous										
		OBJECTIVE	Knowledge transfer										
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		MODEL	Qualitative										
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		STORY	Reality based										
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		ROLES	Real life										
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			Concentrated										
		INTERACTION	Directive										
			Self organizing										
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			Iterative										
		INDICATORS	Qualitative										
			Quantitative										
	ENVIRON-MENT	LOCATION	Single										
			Multiple										
		PLACE	Physical facility										
			Virtual environment										
		MATERIAL	Static										
			Evolving										
		REPRESENTATION	Realistic										
			Symbolic										

Figure 19 – The output of step 1 transferred to the Cross Dimensional Matrix

With the output of step 1 transferred to the matrix, the Cross Dimensional Matrix in figure 19 provides an overview of the potential conflicts. On the horizontal axis the culture difference between the targeted players and the playtesters is presented along the five culture dimensions. On the vertical axis the game elements are stated. For each potential conflict it is explained in Appendix C why there is a potential conflict and one or more suggestions are done to avoid or mitigate this conflict. However, before adapting the game using these suggestions the relevance of each potential conflict needs to be determined. This is done in the next and final step of the culture driven game design iteration.

4.4 Step 3 – Determining relevance of suggested game elements

The final step in the culture driven game design iteration is to determine the relevance of the potential conflicts identified in the first two steps. The position of the third step of the culture driven game design iteration is depicted in figure 20.

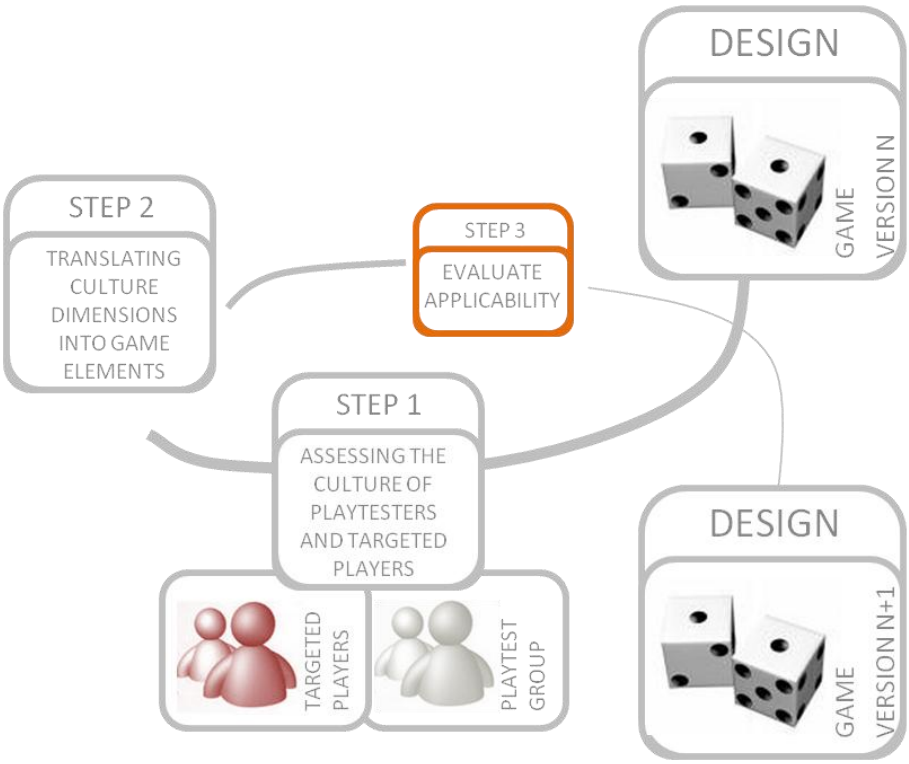

Figure 20 – Step 3 in the culture driven game design iteration

Not each potential conflict is relevant. Take for example a group of players who have a far more hierarchical culture than the playtesters used earlier in the design. Identified as possible conflict is the combination of the hierarchical culture with the mix of players from the operational and executive level. However, as stated in the description of this potential conflict, if the incumbent hierarchy is respected in the game, no conflict is to be expected. It is up to the game designers to determine the relevance of each conflict by interpreting their game.

Once the relevance for all the potential conflicts indicated in step 2 is determined, it is up to the game designer to decide whether game elements should be removed, adjusted or kept in place. Suggestions that can be used to mitigate the identified conflicts are stated together with the potential conflicts in step 2. However, game design remains a creative process which makes each game is different. This provides opportunities to the game designer to avoid the identified conflicts in his own manner. The culture driven game design iteration identifies the potential conflicts between the current version of the game and the players' culture. The method provides suggestions on how to mitigate these conflicts. But the method does not determine how to adapt the game to the players' culture.

The version that follows from this iteration, version N+1, is adapted to the culture of the players.

4.5 The culture driven game design iteration as part of the TGDdm

Now that all steps of the culture driven game design iteration are described, this section places them into the context of the Triadic Game Design development model. As explained in section 3.1 the TGDdm functions as the foundation of the culture driven game design method. The TGDdm consists of multiple iterations. By adding the culture driven game design iteration to the framework of the TGDdm the culture driven game design method is created.

The positioning of the culture driven game design iteration with respect to the other design iterations is up to the user of the culture driven game design method. It is recommended to go through the culture driven game design iteration in the beginning of the design. In this way potential conflicts can be identified and mitigated in an early stage of design in which it is easier to change game. However, this may not always be possible since the identity of the players of the game may only become known in a later stage. While positioning the culture driven game design iteration, the game designer needs to be aware of two restrictions. It cannot be the first iteration since a first version of the game is needed as an input. It can neither be the last iteration since it is necessary to test if the adjusted game elements still form a coherent game.

Next to the agile, iterative, character of the TGDdm there is another important characteristic of the TGDdm. During the design iterations in the TGDdm three components are developed; reality, meaning and play. This development does not stop during the culture driven game design iteration. Adapting the game to the players' culture requires the development of all three components as well. To show this, the design space of Triadic Game Design is depicted in figure 21.

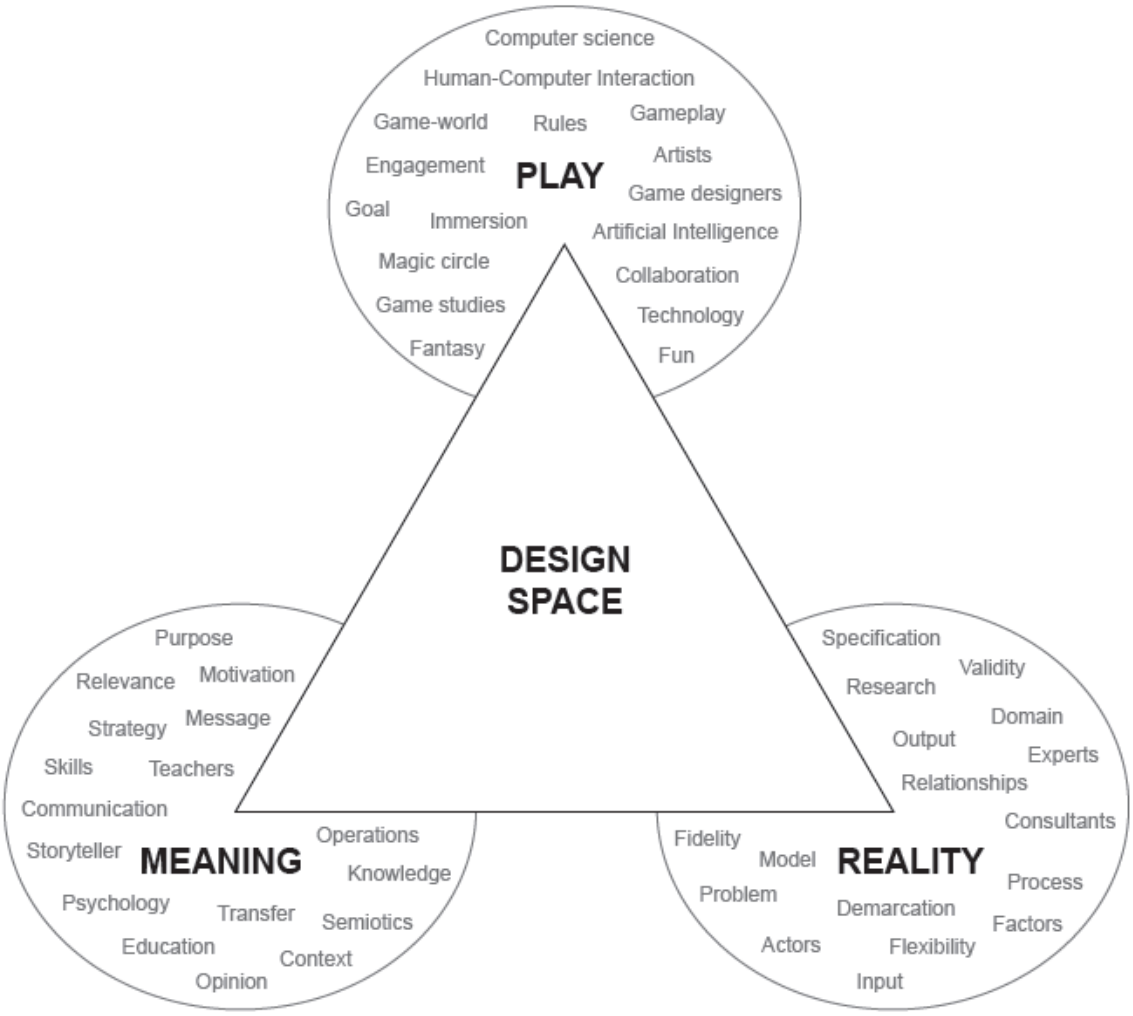

Figure 21 – The design space of Triadic Game Design by Harteveld (2010)

In the figure the design space of the three components reality, meaning and play is shown. It can be seen that the terms affiliated with the development of the three components are also connected to the players culture. For instance the design of rules and collaboration (play component), the design of the context and knowledge transfer (meaning component) and the reality model (reality component) are all identified as potential conflicts in step 2 of the culture driven game design iteration.

It can therefore be concluded that all three components also need to be developed during the culture driven game design iteration. The culture driven game design iteration can therefore be integrated into the Triadic Game Design development model without obstructing the Triadic Game Design philosophy. With this integration the culture driven game design method is formed.

4.6 Conclusions

In this chapter the culture driven game design method was described. The culture driven game design method uses the Triadic Game Design development model as foundation. The TGDdm is an iterative method that follows a design-test-evaluate pattern. Each iteration delivers a new, improved version of the game which will function as an input for the next iteration. To form the culture driven game design method an extra iteration is added to the TGDdm, named the culture driven game design iteration.

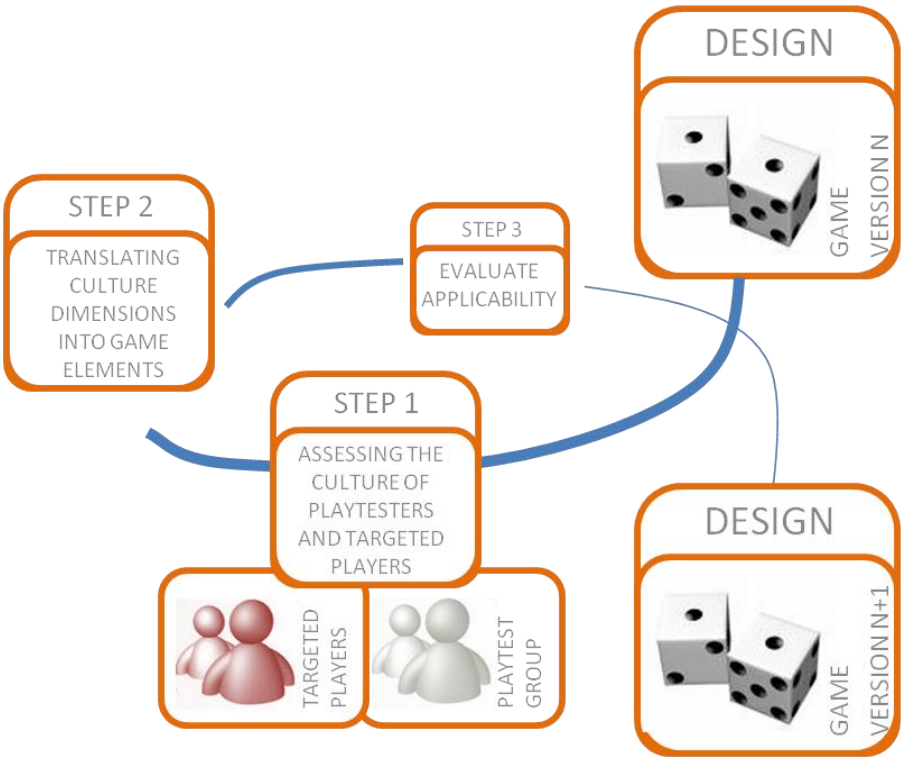

Figure 22 – The culture driven game design iteration

The starting point of the culture driven game design iteration shown in figure 22 is the current version of the game, game version N, which was developed through multiple iterations of playtesting using playtesters. Throughout this process the game was adapted to the culture of the playtesters. In order to adapt the current version of the game to the culture of the players the difference in culture between the players and the playtesters needs to be known. It is therefore that the culture of both the players and the playtesters is assessed in the first step. The output of this first step is a table with the culture assessment of both groups including the difference between them, presented on five culture dimensions.

In step 2 the culture difference presented on the culture dimensions are linked to game elements in the Cross Dimensional Matrix. Using the matrix, a high culture difference on a culture dimension can be linked to potential conflicts with game elements. For each potential conflict it is explained in Appendix C why there is a potential conflict and one or more suggestions are done to avoid or mitigate this conflict. However, before adapting the game using these suggestions the relevance of each potential conflict needs to be determined. This is done by the game designers in the third and final step by interpreting the game. Once the relevance for all the potential conflicts indicated in step 2 is determined, it is up to the game designer to decide whether game elements should be removed, adjusted or kept in place. The version following from the next design step, game version N+1, is adapted to the culture of the players.

CHAPTER 5 –EVALUATION SET UP: THE INDIAN ELECTRICITY GAME

In the previous chapter the design of the culture driven game design method was described. This chapter focuses on the set up of the evaluation of this method. By evaluating the method it is examined if the designed method meets the requirements set in chapter 3.

In the first section (5.1) the set up of the evaluation is described. The culture driven game design method is evaluated by means of two evaluation instruments; case studies and interviews. In the second section (5.2) the set up of the case studies is described. The Indian Electricity Game, introduced in chapter 1, is the game that is used in these case studies. Section 5.3 presents the Indian Electricity Game. In the final section (5.4) the conclusions are drawn. The results of the evaluation experiment can be found in the next chapter.

5.1 Set up evaluation

This section describes the set up of the evaluation of the culture driven game design method. As stated, by evaluating the method, it is examined if the requirements set in chapter 3 are met. This is done by means of two evaluation instruments; case studies and interviews. Table 7 provides an overview of the requirements and the associated evaluation instruments.

Table 7 – Overview of requirements and evaluation intstruments

	REQUIREMENT	EVALUATED BY
A.1	The method must be applicable to all types of serious games.	Case Studies
A.2	The method must be applicable to all types of cultures.	Case Studies
A.3	The method must not include playtesting with the targeted players.	Case Studies
A.4	The method must be able to adapt serious games to the culture of the targeted players.	Case Studies
B.1	The amount of time needed by the serious game designer to apply the method should be minimized.	Case Studies + Interviews
B.2	The amount of time needed for the client of the serious game designer to provide input should be minimized.	Case Studies + Interviews
B.3	The costs to apply the method should be minimized.	Case Studies + Interviews
B.4	It should be possible to apply the method without any knowledge of theory on culture.	Case Studies + Interviews
C.1	The method should provide an overview of the culture of the players.	Case Studies + Interviews
C.2	The method should provide an overview of the critical factors.	Case Studies + Interviews
C.3	The method should provide suggestions how to deal with the identified factors.	Case Studies + Interviews

In table 7 the first two columns include the functional requirements (A-numbers) and non-functional requirements (B and C-numbers). As shown in the third column, the functional requirements are evaluated by means of the case studies. The case studies provide in depth results from which it is possible to draw conclusions regarding the functional requirements. For the evaluation on the non-functional requirements interviews are added to the available evaluation instruments. The non-functional requirements need a judgement of a future user of the method to be able to draw conclusions. In the interview with a serious game designer, a judgement is asked on the requirement-specific data gathered in the case studies.

As discussed in section 1.4 regarding the research instruments, interviews are efficient and relatively simple ways to gather knowledge of field experts. In contrast with interviews, case studies require a more elaborate set up. The following section is dedicated to the set up of these case studies.

5.2 Set up case studies

This section describes the set up of the case studies. In section 1.4 two goals of the case studies were formulated. The primary goal of the case study is the evaluation of the culture driven game design method. The statement that followed from the main requirement that can be tested based on the case studies conducted is: *Without playtesting with the targeted players, the culture driven game design method is able to adapt the Indian Electricity Game to the culture of different groups of players.* The secondary goal of the case study is to gain detailed critique from an in-depth study like the case studies. This detailed critique can be used to improve the culture driven game design method. The critique and the suggested improvements of the method are discussed in Chapter 7 – Discussion and reflection. This section continues with the evaluation goal of the case studies.

The culture driven game design method is evaluated in a case study by comparing it to a benchmark method. This is described in subsection 5.2.1. The benchmark method is the method of which it is known that it is able to adapt a game to the culture of the players; playtesting with the targeted players. Both methods are used to adapt the Indian Electricity Game to the culture of the players. This results in two versions of the game. By comparing the version made with the culture driven game design method with the benchmark version, the statement can be tested. This comparison is described in section 5.2.2. In the final subsection (5.2.3) it is explained that the described evaluation experiment is executed twice.

5.2.1 Benchmarking the culture driven game design method

The culture driven game design method is evaluated in a case study by comparing it to a benchmark method. The main functional requirement of the culture driven game design method is to adapt games to the culture of its players. The benchmark method is the method of which it is known that it is able to adapt a game to the culture of the players; playtesting with the targeted players. In figure 23 the set up of the case study evaluation of the culture driven game design method is depicted.

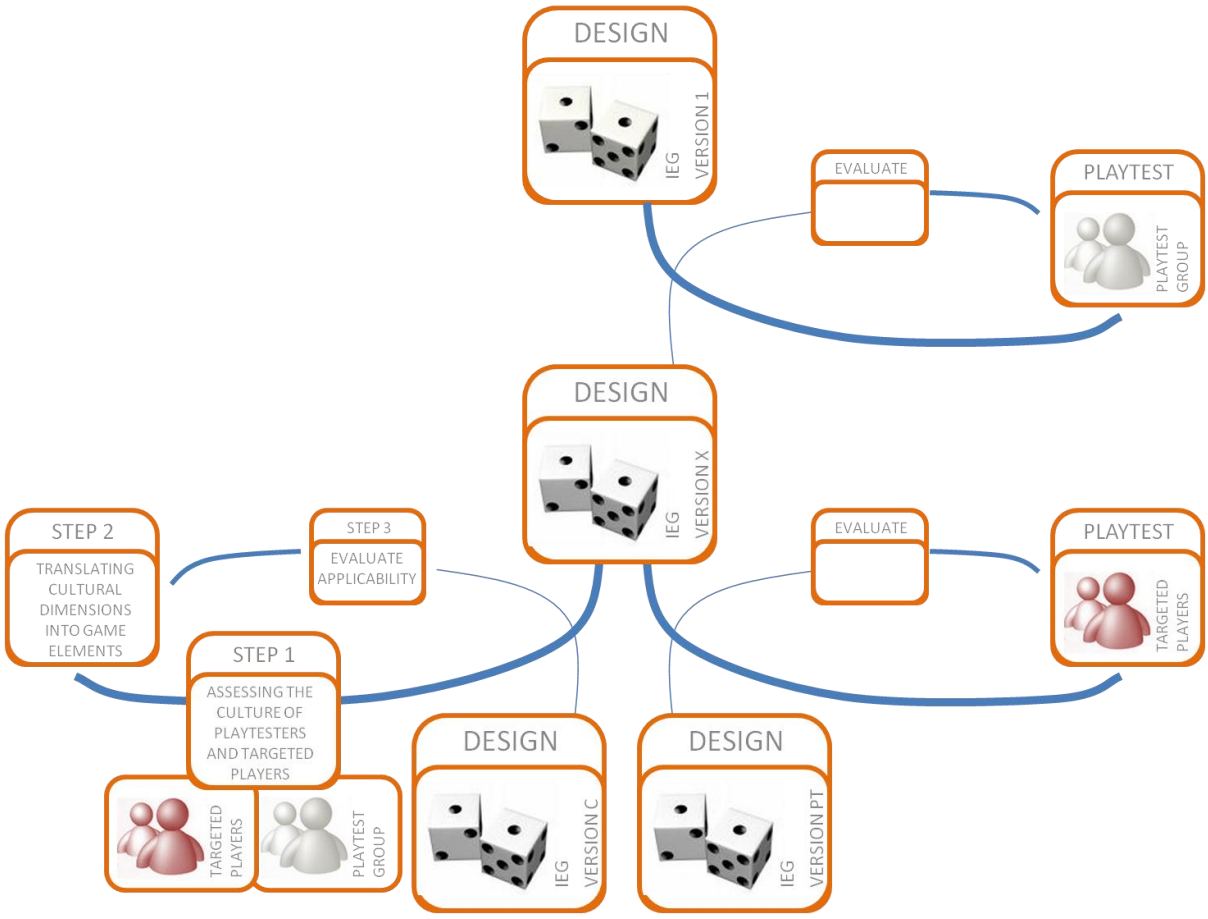

Figure 23 – The set up of the case study evaluation of the culture driven game design method

The game used for the evaluation is the Indian Electricity Game (IEG). As depicted in figure 23, the IEG is developed through multiple design iterations using a set of playtesters as prescribed by the culture driven game design method. IEG version X is the version the designer ends up after several design iterations. This version X of the IEG is not yet adjusted to the culture of the targeted players.

Version X is adjusted to the culture of a selected group of players using two methods; the culture driven game design method and the benchmark method: playtesting with the targeted players.

As discussed in the problem introduction, by playtesting with the targeted players, game designers are able to adjust their serious games to the culture of the targeted players (Fullerton, 2008). So by playtesting version X with the targeted players, this version is adapted to the culture of the players. It is therefore that the version of the IEG that results from the playtest iteration, dubbed *IEG version PT,* can function as a benchmark. The version of the IEG that results from the culture driven game design iteration is dubbed *IEG version C*.

By comparing IEG version C with the benchmark version, the following statement can be tested: The culture driven game design method was able to adapt the Indian Electricity Game to the culture of different groups of players.

5.2.2 Static and dynamic comparison

In the case study described in the previous subsection two versions of the Indian Electricity Game are compared. These two versions of the game are compared in two ways;

- Static comparison – in which the versions are compared without playing them. During this comparison the game elements that are changed and the reasons why certain game elements are changed are examined.
- Dynamic comparison – in which the versions are compared by playing them. During this comparison the cultural fit during the sessions of both versions is examined. To determine the cultural fit of both games typical instruments used in game evaluation are employed (Eisenhardt, 1989); questionnaires for the players before and after the game, independent observers assessing the cultural fit and interviews with the players. Next to these instruments the sessions are videotaped, which enabled us to watch the sessions again.

Where the static comparison is done in a relatively simple environment, the dynamic comparison is executed in a more complex environment. To be able to draw conclusions from the dynamic comparison it is necessary to control the context in which the game is played. An explanation is given, structured by the theoretical basis of this research depicted in figure 24.

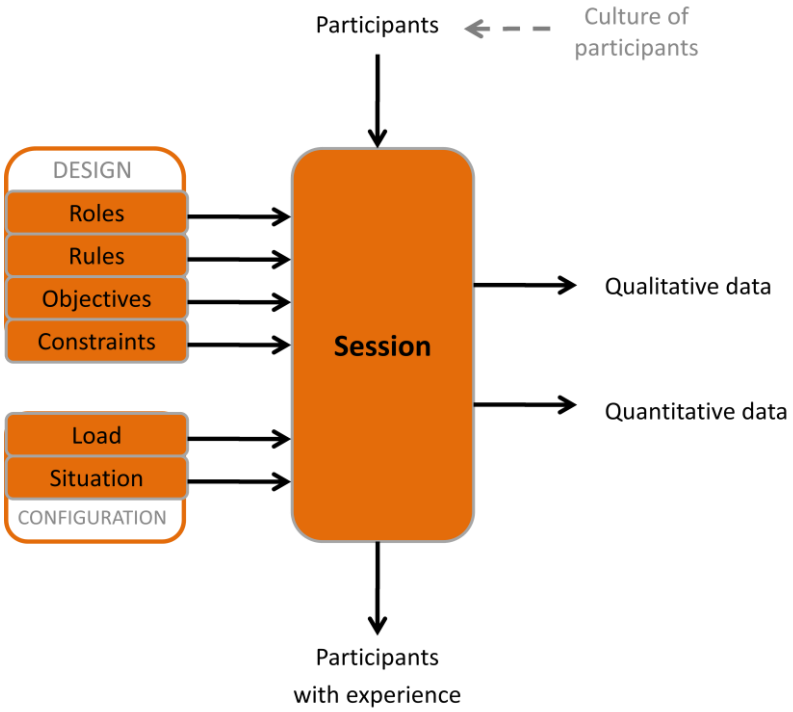

Figure 24 – The inputs and outputs of a game session, adapted from Meijer (2009)

In the dynamic comparison it is not two designs that can be compared, but the outputs of two sessions. One session is held by playing IEG version C and another session uses IEG version PT. In order to conclude something about the differences between the designs, the other inputs of both sessions should be the same. As shown in figure 24 there are three main inputs for a session; participants, design and configuration. If able to control the participants and configuration for both sessions, the differences in the outcomes are caused by the differences in the designs. Both inputs, the participants and the configuration, are discussed here.

Participants

The first input that is discussed are the participants. A complicating aspect in the dynamic comparison is the experience the players gain when playing games. Suppose that team red plays 'IEG version C' first. Next team red plays 'IEG version PT'. Since team red has experience playing 'IEG version C' the second game played will have a smoother play than the case where team red would not have that experience, regardless whether 'IEG version PT' has a better 'cultural fit' or not.

In order to correct the case study for the disturbing effect of experience gained by the players a second team is introduced, team blue. A condition that comes with the introduction of a second team is that these players should be equal to the first team of players. If this is not the case the difference in output of the sessions could be caused by the differences between the players instead the difference between the game designs.

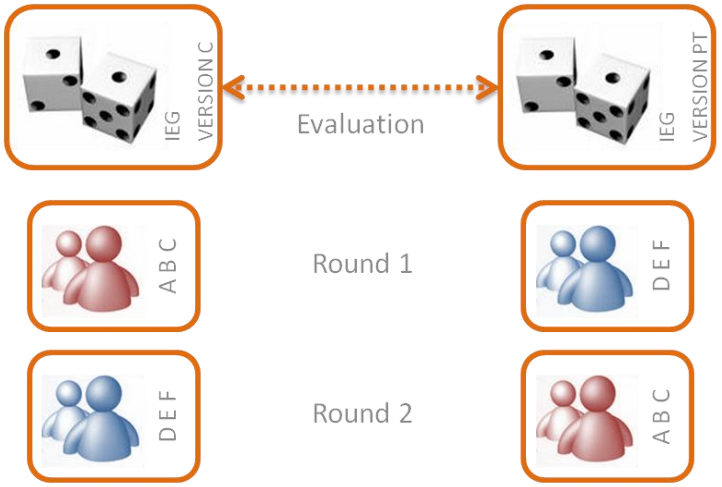

Figure 25 – The rounds in the case study evaluation

An attempt is made to compose two identical teams by selecting players of the same age, who graduated in the same field of education, who work in the same company, at the same department and have similar scores on the culture dimensions of Hofstede. However, the condition set cannot be fully satisfied argues Meijer: players can be selected and they can be instructed about the rules, roles, objectives and constraints but that cannot take away the relational history, experiences and world view of the humans that participate (Meijer, 2009).

It is therefore that a second round is added to the case study. In the second round the two teams play the opposite games. By playing a second round player specific behaviour can be identified. This is clarified by an example. Imagine the following behaviour: one of the players appropriates the role of team leader although the assumed roles in the game appoint someone else as the leader of the game. This behaviour is able to ruin the learning objectives as the leader may neglect their input. In the further description of a case study which is corrected for player specific behaviour, the described behaviour is referred to as *behaviour A*.

In round 1 behaviour A is observed in the session of team red playing version C. Behaviour A is not observed in the session of team blue playing version PT. If uncorrected for the player specific behaviour this would lead to the conclusion that behaviour A is caused by an element changed in version C. However, if in round 2 behaviour A can be observed in the session of team red playing version PT and not in the session of team blue playing version C, it changes the conclusion. It appears that behaviour A is not related to the version of the game, but related to the team which plays the game. In this way the addition of the second round allows the case study to be corrected for the player specific behaviour caused by the difference between the players in the two teams.

To summarize the above: In the dynamic comparison IEG version C and IEG version PT are compared by playing them with two teams. In order to draw conclusions from the output of the sessions about the differences in the game designs, the players in the sessions must be the same. Therefore, the players in the two teams are selected based on similar scores on a variety of characteristics. However despite their careful selection, it is not possible to claim these players will react the same in identical situations. It is therefore that a second round is played in which player specific behaviour can be identified and disregarded in the conclusions of the case study.

Configuration
The second input that is discussed is the configuration of the session. By means of the configuration a design can be tuned for different sessions. The configuration consists of the load and the situation. The load are the values of the parameters in the design of the game, like how many participants in a role and how much money to start with. Whereas the situation is defined by the values of the parameters which are not part of the design of the game including the selection of participants and the amount of information they received on beforehand.

As Meijer stated when describing gaming as a research method, both the load and the situation can be controlled (Meijer, 2009). In the evaluation experiment the same values of the parameters can be chosen for each session.

One remark that needs to be made is that the culture driven game design method prescribes the adjustment of the values on certain parameters, like the amount of time available or the amount of players in a team. If the values of the parameters are prescribed, there are no session specific variations. In that way the parameters which were considered load became part of the design. It can therefore be concluded that the configuration can be controlled so that the sessions in the evaluation experiment do not vary on this input.

Having discussed the configuration and the participants, the following can be concluded. The configuration can be controlled which makes it possible to even the configuration in both sessions. The players cannot be completely controlled. However, by carefully selecting the players and playing a second round in which player specific behaviour can be identified and removed from the experiment it is possible to approach two equal teams of players. As all input of the sessions are controlled, it is possible to draw conclusions from the session outcomes regarding the cultural fit of both designs.

5.2.3 Multiple case studies
In the previous subsections the set up of the case study evaluation was described. The culture driven game design method is evaluated in a case study by comparing it to a benchmark method. The benchmark method is the method of which it is known that it is able to adapt a game to the culture of the players; playtesting with the targeted players. Both methods are used to adapt the Indian Electricity Game to the culture of the players. This results in two versions of the game. By comparing IEG version C with the benchmark version, the following statement can be tested: The culture driven game design method was able to adapt the Indian Electricity Game to the culture of different groups of players.

However, this statement cannot be tested without repeating the case study. It is therefore that the case study is done twice. By carefully selecting the cases the value derived from the case studies can be increased. Flyvbjerg presents different strategies for the selection of cases (Flyvbjerg, 2006). Given the limited number of cases it makes sense to select cases which are the extreme opposites from each other so that the process of interest is “transparently observable” (Eisenhardt, 1989; Pettigrew, 1990). The following cases were prepared:

- Case Study 1 – In this case there is a large culture difference between the playtesters and the targeted players. The targeted players are all employees of CSTEP.
- Case Study 2 – In this case there is no culture difference between the playtesters and the targeted players. The targeted players are students of the Delft University of Technology.

The amount of culture difference is what makes these cases each other’s opposites. As described in section 1.2, this research is demarcated to the influence of culture from the informal institutions situated in the highest layer of the four layer model of (Williamson, 2000). It is therefore that the

culture of the playtesters and the targeted players situated in the lower layers should be levelled in the case studies.

The lower three layers constitute knowledge on the formal institutional environment, governance structures and resource allocation. Knowledge regarding these layers is predominantly gained in education and work experience. In Case Study 1 the educational background and the work experience of the playtesters and the targeted players were levelled. This was relatively easy since both the playtesters and the targeted players were CSTEP employees of the same age who graduated in the same field of education at comparable Indian schools. This was different in Case Study 2. The targeted players in Case Study 2 were educated at a Dutch university about Dutch and European institutions and governance structures. To level the knowledge regarding the lower three levels of the targeted players with the playtesters from CSTEP a more elaborate briefing and debriefing is given on the Indian electricity sector. In this way the targeted players in Case Study 2 were supplied with all the institutional knowledge necessary to level them with the playtesters.

With the introduction of the multiple evaluation experiments the set up of the of evaluation is described to its full extent. In the next section the game used in the evaluation experiments is described.

5.3 Game of case study evaluation: Indian Electricity Game

In the previous section the Indian Electricity Game was introduced that was used during the case studies. The Indian Electricity Game was developed at the Centre for Study of Science, Technology, and Policy (CSTEP). As described in the preface, CSTEP is a private, non-profit organization with a vision to undertake research in engineering, science, and technology where it is relevant to the country's economic and human development. CSTEP works in areas such as energy, infrastructure, materials science, information and communications technologies, and security.

One of the challenges India faces which is relevant to both the economic and human development of the country is answering the increasing demand for electricity. This challenge has been the subject of various research projects by CSTEP and other organizations. In order to get relevant actors acquainted with the results of these research projects, the decision was taken to construct a game with this challenge as the subject. The Indian Electricity Game described here is the first version of that game. This first version functions as the basis for a larger simulation game that should be created in the future. By the time this research is published the design of version two is started.

GAME DIMENSIONS			
	CONTEXT	PROBLEM	Understood
			Ambiguous
		OBJECTIVE	Knowledge transfer
			Knowledge creation
		MODEL	Qualitative
			Quantitative
		STORY	Reality based
			Metaphor based
	PARTICIPANTS	TARGET	Single-individual
			Multiple groups
		LEVEL	Operational
			Executive
		ROLES	Real life
			Assumed
		CULTURE	Homogeneous
			Heterogeneous
	PROCESS	SEQUENCE	Real time
			Concentrated
		INTERACTION	Directive
			Self organizing
		STEPS	Sequential
			Iterative
		INDICATORS	Qualitative
			Quantitative
	ENVIRON-MENT	LOCATION	Single
			Multiple
		PLACE	Physical facility
			Virtual environment
		MATERIAL	Static
			Evolving
		REPRESENTATION	Realistic
			Symbolic

Figure 26 – Game dimensions of Wenzler (2008)

This section the first version of the Indian Electricity Game, the version that was used in the case studies, is described along the game dimensions of Wenzler's model. This structure of game dimensions was preferred over a chronological description of the game since the same game dimensions were used in the culture driven game design method. (An additional chronological description of the game can be found in Appendix D.) The game dimensions, as shown in figure 26, are grouped into clusters of four

dimensions; context, participants, process and environment. The following four subsections each describe the game dimensions of a cluster.

5.3.1 Context of the Indian Electricity Game

The first cluster of game dimensions describes the problem, the objectives of the game, the model and the story used in the game. This is shown in figure 27.

CONTEXT	PROBLEM	Understood
		Ambiguous
	OBJECTIVE	Knowledge transfer
		Knowledge creation
	MODEL	Qualitative
		Quantitative
	STORY	Reality based
		Metaphor based

Figure 27 – Context dimensions of Wenzler (2008)

Problem

China and India account for almost two fifth of the world population, but less than one-fifth of the world's primary energy use (Pachauri & Jiang, 2008). This makes India with its 1,2 billion inhabitants, a poor energy consumer (CSTEP, 2009; United Nations, 2009). Currently, India has an installed capacity of 152.148 MW (Central Electricity Authority, 2009).

But the use of energy and economic growth go hand in hand (Planning Commission, 2008). India wants to achieve an economic growth of 8 to 10% per year. In order to accommodate this growth the electricity generation capacity must increase to nearly 800.000 MW in 2030 (Expert Committee, 2006) pg. xiii. This is over five times the current installed capacity. This parallel development of economic growth and energy use makes India and China accountable for over half of the increase in world primary energy demand between 2006 and 2030 (International Energy Agency, 2008). To meet these targets India needs to overcome several issues that complicate this challenge. These issues are grouped into three categories: economical – technical issues, political issues and managerial issues.

Economical – technical issues

As shown in the current energy mix for electricity generation in figure 28, India is heavily dependent on coal (Pachauri & Jiang, 2008). Only 6% of the coal is imported and 94% comes from domestic reserves (Ministry of Coal, 2008). According to projections of the Ministry of Coal this import quote will not have to change the coming years (Ministry of Coal, 2008). The Indian coal reserves are estimated at 250 billion tons (Bharadwaj, Tongia, & Arunachalam, 2006; Ministry of Coal, 2008). It is estimated by the planning commission that if coal consumption increases at 5% per annum, then economically extractable coal could run out in 45 years (Bharadwaj, Krishnan, & Rajgopal, 2008). These 45 years are a modest estimation since India's energy supply needs to grow at 6% per annum to accommodate the projected economic growth (Expert Committee, 2006). Other estimations therefore range from 30 to 40 years before India runs out of economically extractable coal (Chikkatur, Sagar, & Sankar, 2009).

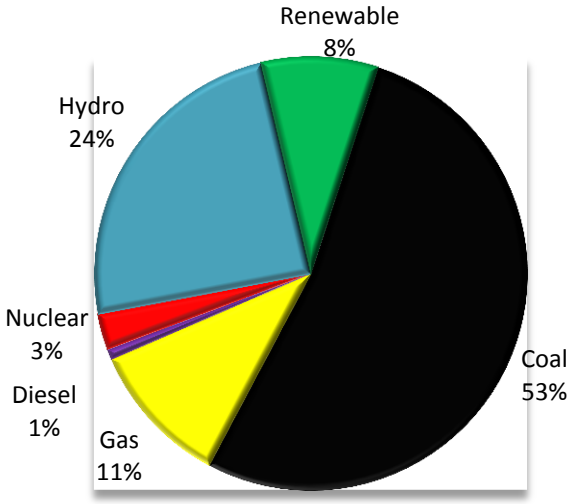

Figure 28 – Fuel mix for electricity generation, Central Electricity Authority (2009)

The depleting coal reserves are one of the reasons that India cannot afford to exclude any energy source available for electricity generation. Present sources for thermal electricity generation are considered, like coal, diesel and natural gas. But considering the scarcity of fossil fuel reserves, energy security and climate change it is also expected that renewable energy will play a significant

role in India's future energy mix. (Pillia & Banerjee, 2009). Figure 29 provides an overview of the different renewable energy sources as considered in India.

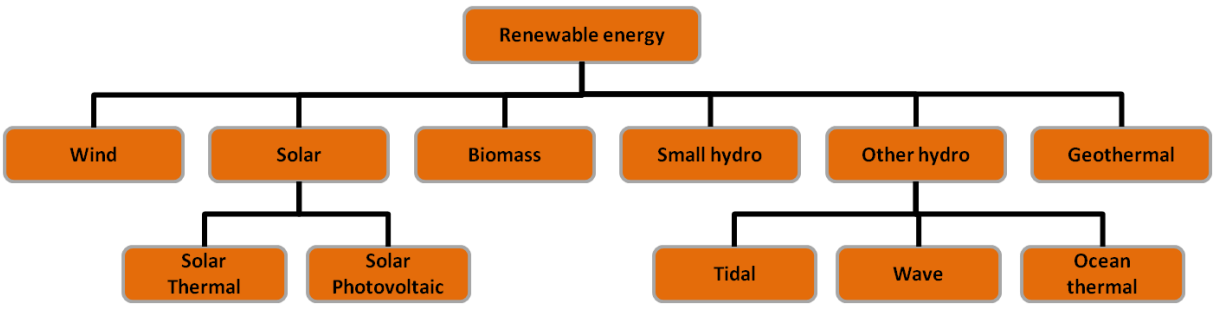

Figure 29 – Renewable energy sources considered in India adapted from Pillia & Banerjee (2009)

The various energy sources for electricity generation have different characteristics. For instance; a 1000 MW Fast Breeder Reactor (FBR), a particular type of nuclear reactor, costs about Rs. 1.00.00.00.00.000 (100 billion INR) to build (Bharadwaj, et al., 2008). This construction can be completed in 6 years assuming overnight construction (Bharadwaj, et al., 2008). Looking at 1000 MW generation capacity of wind energy provides a completely different image. To build 1000 MW generation capacity of wind energy an investment is needed of Rs. 50.00.00.00.000 (50 billion INR) (Pillia & Banerjee, 2009). This is half of the investment needed for the FBR and the construction can be done in phases which opens the opportunity to spread the investments. But wind energy is very location specific and intermittent (Bharadwaj, 2007). Another characteristic is the cost of generation measured in Rs./kWh. Comparing sources of energy on this characteristic shows that small hydro projects produce electricity 10 to 20 times cheaper than solar PV projects (Pillia & Banerjee, 2009). These examples of economical – technical issues provide some insight in the complexity of the choice on which energy sources to turn to when increasing the electricity generation capacity.

Political issues

Next to these economical – technical issues, there are political issues that contribute to the complexity of the challenge to meet the increasing electricity demand. One of these political issues is climate change, a worldwide problem caused by an increase of the proportion CO_2 in the air. Together with the depleting coal reserves, climate change is an important force that drives India away from the use of coal. Three quarters of the projected increase in energy-related CO_2 emissions will arise in China, India and the Middle East (International Energy Agency, 2008). As a consequence there is growing pressure on India for proactive action (Bharadwaj, 2007). This call for proactive action is already stated by several respected international organizations like the International Energy Agency: "Vigorous, immediate and collective policy action by *all* governments is essential to move the world onto a more sustainable energy path" (International Energy Agency, 2007). Another organization that called for action is the United Nations. The UN have called for developed countries to cut CO_2 emissions by 80% by 2050 and developing countries by 20% from 1990 levels. "India has strongly objected to this since most of the build-up of CO_2 is due to industrialisation of the west and India has low per capita CO_2 emissions" (Bharadwaj, 2007). But although India rejected the CO2 cuts, there are signs that India does not totally ignore the call for more sustainable initiatives (Bharadwaj, 2007). In the article of Bharadwaj carbon credit trading and carbon-free technologies are considered opportunities (Bharadwaj, 2007).

Another political issue that plays a role in this challenge is the security of energy supply. As Nandi and Basu conclude, the transition towards renewable energy sources can be the way to achieve energy security (Nandi & Basu, 2008). The majority of the renewable energy sources are readily available which makes a nation less dependent on the import of energy sources. Energy security is a relevant

political issue for India which plays a role in the choice for the different energy sources to use for electricity generation. As discussed, the domestic coal reserves are limited, so are the national natural gas reserves. For fuelling the nuclear power plants India is mainly dependent on the import of uranium (Bharadwaj, 2007). Also the hydro electricity stations will be short on 'fuel' as water becomes scarcer. It drives the government to tradeoffs between water for agricultural use or using it for the generation of electricity.

Managerial issues
The third set of issues that complicates the challenge for meeting the increasing electricity demand are managerial or governmental issues. In the current situation the government of India is the dominating party in the electricity sector. The government sets the policy and regulations that apply to the electricity sector, they own the majority of generation, transmission and distribution companies and disputes are settled through government appointed tribunals (IBEF, 2010). Market trading is introduced but so far the share of electricity supplied by private parties remains marginal. Reasons given for this marginal share for private companies are the strict rules private companies need to apply to when selling electricity through the government owned grid, the poor billing system and the large losses due to electricity theft (Bharadwaj, et al., 2006). This is in contrast with the interests of the Indian government which could very well use the private capital to realise the intended increase in generation capacity.

Another managerial issue that complicates the functioning of the electricity sector is the communication between the different government agencies. The Indian government is present at a central level as well as a state level. This dual existence accounts at both the policy and the operational level of the electricity sector, from generation to transmission, from planning to appeal. This institutional structure shelters conflicting interests which leads to complicated communication processes.

Challenge
From the above it can be concluded that the situation that India faces can be called challenging. In order to accommodate the economic growth India needs to install an additional four times the current generation capacity in the coming 20 years. This needs to be done in an arena where a variety of electricity generation techniques is available but also various economical, technical, political and managerial issues play a large role. This problem is classified as a multi actor, complex problem since multiple actors are involved bringing their conflicting interests to the negotiation table in a situation in which more than technical knowledge is needed to make decisions that work towards a solution. This challenging problem is the subject of the Indian Electricity Game.

Objectives
As stated in the introduction of this section, the Indian Electricity Game is constructed to get relevant actors acquainted with the lessons that can be learned from the various research projects conducted by CSTEP and other research institutions. So the main objective of the game is knowledge transfer regarding the various economical, technical, political and managerial issues that play a large role when constructing the electricity generation capacity that is needed. The following issues have been included in the design of the Indian Electricity Game;

- Construction time and the influence on meeting the electricity demand,
- Investment costs of different generation plants,
- Cost of generation of different generation plants,
- Carbon emissions of different generation plants,
- Availability of different energy sources and the influence on the security of energy supply,
- Technical issues with the different energy sources,
- Social issues related to the utilization of the different energy sources,
- Cooperation between the different central government institutions.

The challenge that India faces is far more complex than this collection of issues. However due to a restricted play time of two hours, the complexity handled in this first version of the game is limited. Suggestions for the coming versions of the game are discussed in section 8.2: Recommendations.

Next to the objective of the game to transfer knowledge to the participants regarding the stated issues there is a second objective. Since serious gaming as a policy instrument is a relatively new technique, especially in India, the majority of the Indian participants does not have any experience with playing a serious game. In order to come to good results with the Indian Electricity Game and other CSTEP games in the future, it is necessary that the participants experience the Indian Electricity Game as a mature policy instrument with potential.

Now the subject and the objectives are described, the remaining part of this section describes the Indian Electricity Game. Emphasis in this description is given to the game elements that contribute to achieving the objectives of the game mentioned here.

Model

A quantitative model in the form of a planning assignment forms the core of the Indian Electricity Game.

As explained in the challenge description, the government of India uses five year plans to plan the construction of electricity generation capacity. The current 11th plan ends in 2012. The players of the Indian Electricity Game need to construct the 12th plan (2012-2017) and the 13th plan (2017-2022). The Indian government used electricity demand estimations to calculate the necessary increase of generation capacity for each plan (Expert Committee, 2006). In the 12th plan the construction of 86,000 MW generation capacity needs to be planned. In the 13th plan the necessary increase of generation capacity is calculated to be 1,19,000 MW.

For this capacity extension six energy sources are available in the Indian Electricity Game; coal, natural gas, nuclear power, hydro power, wind and solar power. These are the five energy sources with the largest share in the current energy mix for electricity generation in India, completed with solar power as one of the most promising renewable energy sources. For each of the energy sources, the players can choose between three plant types, that score differently on various characteristics. This leads to the format of the five year plan that the players need to construct as shown in table 8.

Table 8 – IEG: Format of the 12th five year plan

ENERGY SOURCE	PLANT TYPE			
	A	B	C	TOTAL
COAL				
NATURAL GAS				
NUCLEAR				
HYDRO				
WIND				
SOLAR				
				86,000 MW

The players receive information on the investment costs, costs of generation and CO_2 emissions for each energy source – plant type combination. To provide an example the information of a Type C Hydro electricity plant is shown in figure 30. With this information the players should be able to negotiate towards a five year plan that adds up to 86,000 MW. An example of a constructed five year plan for the 12th period is shown in table 9.

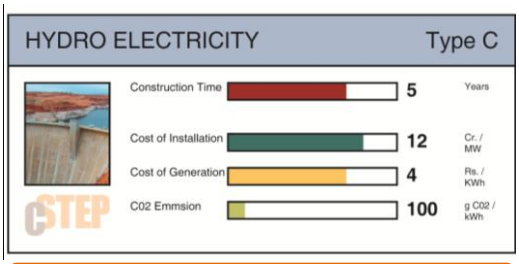

Figure 30 – IEG: Information available on hydro electricity plant type C

Table 9 – IEG: Example of developed 12th five year plan

FUEL SOURCE	PLANT TYPE			
	A	B	C	TOTAL
COAL	30,000 MW	11,000 MW	8,000 MW	49,000 MW
NATURAL GAS		7,000 MW		7,000 MW
NUCLEAR			3,000MW	3,000 MW
HYDRO	4,000 MW	11,000 MW		15,000 MW
WIND		10,000 MW		10,000 MW
SOLAR	2,000 MW			2, 000 MW
				86,000 MW

This planning assignment forms the core of the game. During this planning assignment three economical – technical issues as described in the objectives of the game are handled;

- Investment costs of different generation plants,
- Cost of generation of different generation plants,
- Carbon emissions of different generation plants.

Story

The choice is made not to use a metaphor for the story of the Indian Electricity Game. Although metaphors may be very powerful tools to convey a message it requires a certain amount of confidence in serious gaming as a policy tool. As one of the objectives of the game is to create this confidence the story is based as much as possible on the reality.

5.3.2 Participants of the Indian Electricity Game

The second cluster of game dimensions is concerned with the participants of the game. It includes the game dimensions of targeted participants, the organizational level of the participants, the roles that have to be played and the organizational culture of the participants.

PARTICIPANTS	TARGET	Single-individual
		Multiple groups
	LEVEL	Operational
		Executive
	ROLES	Real life
		Assumed
	CULTURE	Homogeneous
		Heterogeneous

Figure 31 – Participants dimensions of Wenzler (2008)

At the start of the design of the Indian Electricity Game it was unknown who would be the targeted players. Fields in which the game could be useful ranged from commercial service providers in the electricity sector to universities and institutions of the central government. This first version of the game would be used to attract interested organizations to further develop the Indian Electricity Game. For this reason CSTEP wanted this first version of the game to be easily adjustable to a variety of players.

This flexibility requirement for the first version of the Indian Electricity Game was fulfilled by a focus on a high level problem that relates to all kinds of organizations. With the high level planning

assignment as the basis for further versions it is relatively easy to develop the game towards a variety of players. The structure of the game is as such that new issues and roles can be added without having to change this structure.

Although the targeted players were unknown at the beginning of the design, choices are made regarding the game dimensions in the participants cluster. In the cases an assumption regarding the participant characteristics was needed, this is explicitly mentioned in the description of the game dimension.

Target
The Indian Electricity Game is designed for three people. The goal of the three players, the team goal, is to construct the 12th and 13th plan. Next to the team goal, all three players all have a personal goal attached to their individual roles in the game.

Level of the organization
As discussed, the targeted participants were unknown at the start of the design. Since the possible players varied from students to high level commercial and government employees no estimation could be made of the level of organization of the participants. It is assumed that players are from the same level of the organization and therefore have a comparable amount of knowledge on the topics discussed.

Roles
Each of the three players has a individual role in the game; one is a representative of the Planning Commission, one is a representative of the Central Electricity Authority and one is a representative of the Ministry of New and Renewable Energy. These three roles do not cover the complete institutional environment of the Indian electricity sector. The choice to limit the institutional complexity in this first version of the IEG to three roles was driven by the design constraints of time and flexibility. The three roles included in the game were chosen such that part of the institutional complexity, such as conflicting interests, is experienced when playing the game. The personal goals were translated from the function of the institution and simplified in order to fit the complexity of the game without harming reality. A description per role:

Planning Commission – The Planning Commission is a governmental institution chaired by the Prime Minister of India that has the task 'to formulate a plan for the most effective and balanced utilization of country's resources' (Planning Commission, 2010). This leading role in assembling the five year plan is transferred to the Indian Electricity Game. This leading role is emphasized by giving the representative of the Planning Commission the personal objective to control of the budget available for the 12th and 13th plan.

Central Electricity Authority (CEA) – The CEA is the official government body that has the task to reform the Indian power sector. In this reform process the CEA has an advisory role to the central government on both technical and economical issues (Central Electricity Authority, 2010). This advisory role is transferred to the Indian Electricity Game by means of the role description. The personal objective in the game for the representative of the CEA is to ensure a cost of generation lower than 3 Rupees per kilowatt hour.

Ministry of New and Renewable Energy (MNRE) – The MNRE is the ministry that has the mission to increase the share of clean power. This mission originates from the vision to secure energy supply by aiming for self sufficiency (Ministry of New and Renewable Energy, 2010). After the United Nations Climate Change Conference in Copenhagen in December 2009 India announced eight National Missions on climate change (Ministry of New and Renewable Energy, 2009). The MNRE has a supporting role in several of these National Missions trying to curb the carbon emissions. From the

two goals of the MNRE, ensuring security of energy supply and reducing carbon emissions, one is chosen as the personal objective for the representative of the MNRE in the Indian Electricity Game. Due to the limited play time available for the Indian Electricity Game it is decided to provide each role with only one personal objective. The choice is made to regard security of energy supply as a less eminent team objective. Reducing the carbon emissions is the personal objective for the representative of the MNRE.

Culture

For the design of the Indian Electricity Game it was assumed that the players would have a relatively similar organizational culture.

5.3.3 Process of the Indian Electricity Game

The third cluster of game dimensions, process, describes the sequence of the game, the organization of interaction between the players, the steps within the game and the nature of the indicators used in the game.

PROCESS	SEQUENCE	Real time
		Concentrated
	INTERACTION	Directive
		Self organizing
	STEPS	Sequential
		Iterative
	INDICATORS	Qualitative
		Quantitative

Figure 32 – Process dimensions of Wenzler (2008)

Sequence

The time line in the Indian Electricity Game is very concentrated. The process of composing a five year plan for the construction of 86,000 MW equivalent of electricity generation capacity is concentrated in 30 minutes.

Interaction

The players of the Indian Electricity Game have a large degree of freedom in organizing the interaction. There is no format that the players have to follow when composing the five year plans, although hints are dropped shaping the interaction. These hints are given by means of the presentation of the information to the players. The players are provided with information through a leaflet at the start of the game and small messages throughout the game play session.

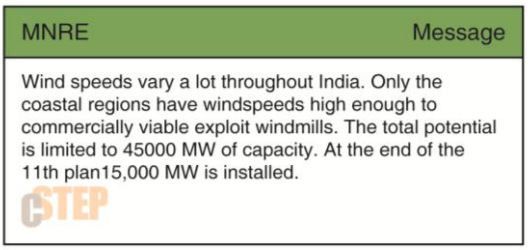

Figure 33 – IEG: Example of private message

When designing the 12th plan the players receive information on the characteristics of the different energy source – plant type combinations and their personal objectives in the form of a folded leaflet. This leaflet insinuates that the information within is not to be shared with the other players. However, the players are free to choose whether to share the information or not. In most of the sessions it takes the players five to ten minutes to find out that they need to combine their information in order to come to an educated five year plan. This start up period symbolizes the struggle over information between the different government institutes.

Throughout the session the players receive messages as the one shown in figure 33. These messages contain information on the following issues:

- Availability of different energy sources and the influence on the security of energy supply,
- Technical issues with the different energy sources,
- Social issues related to the utilization of the different energy sources.

There are two types of messages; public messages and private messages. Public messages are available to all players whereas private messages are given to the respective player. Just as the folded leaflet, the private messages insinuate that the information is not to be shared with the other players. In the test play session most of the play testers follow this hint and find out during the game that in order to come to a five year plan within the restrictions set, the information needs to be shared.

Through these hints the interaction is shaped in such a way that the players behave like non cooperating government institutions. This behaviour is reflected upon during the debriefing to connect it back to the issue of;

- Cooperation between the different central government institutions.

Steps

As described earlier, the players of the Indian Electricity Game need to design the 12th and the 13th plan. The game therefore exist of two similar iterations in which the options available in the second iteration depend on the actions in the first iteration.

Indicators

The indicators for the personal objectives are quantitative whereas the indicators for the team objectives are qualitative. This difference in indicators originates from the nature of the objectives. The indicators of the personal objectives; cost of generation, investment costs and CO_2 emissions are relatively easy to quantify. They are mainly determined by the characteristics of the generation plant type. This in contrast with the indicators of the team objectives. Technical issues, fuel availability, issues of social costs are hard to quantify due to uncertainty or the absence of a method for quantification. For instance the availability of nuclear fuel depends on political agreements which are surrounded by uncertainty. Another example is that there is no consensus on how to quantify the trade-off between the utility that people receive from power supply and the rehabilitation of multiple villages necessary for the construction of a dam.

The difference between qualitative and quantitative indicators in the Indian Electricity Game serves a purpose. Quantitative indicators are easy to compare and provide immediate feedback on the performance of a player. This in contrast with the qualitative indicators which are more difficult to compare and provide a less clear performance feedback. In gaming situations this often leads to strategies focused on optimizing the performance on the quantitative indicators. This is what happened in the various playtest sessions. The players optimized on their personal objectives, using quantitative indicators, and thereby disregarded the team objective to a certain degree. This behaviour in the game provides the necessary material to address the following issues in the debriefing:

- Availability of different energy sources and the influence on the security of energy supply,
- Technical issues with the different energy sources,
- Social issues related to the utilization of the different energy sources.

These issues are debriefed using fictional newspaper messages. By means of these headlines and newspaper pictures the facilitator is able to provide a performance feedback on the qualitative indicators. The newspaper messages can be found on the CD attached to the back of this report. The performance feedback on the quantitative indicators is provided by discussing the outcomes of the designed plan in comparison with the targets set for each role.

There is one final issue that combines quantitative and qualitative indicators to provide feedback to the players;

- Construction time and the influence on meeting the electricity demand,

In order to be able to provide performance feedback to the players regarding this issue, the increase in electricity demand is assumed linear over the years within the five year plan that is composed. The increase in generation capacity according to the composed plan is plotted in the same graph. This graph illustrates the difference between generation plants that can be realized in a short amount of time and those plants that have a construction time of multiple years. This graph is explained to the team in the debriefing after the 12th and 13th plan.

Evaluating the construction time in this manner requires a lot of assumptions. But in later versions a continuous progress of time is expected which provides better opportunities of evaluating the influence of construction time. For this reason the choice is made not to devote too much attention to this issue.

5.3.4 Environment of the Indian Electricity Game

The fourth cluster is defined in the following game dimensions; location of play, place, material and representation.

This first version of the Indian Electricity Game is used as a basis for the development of a larger simulation game. For this reason it was agreed to keep the game simple in terms of environment. A brief description of the game dimensions:

ENVIRON-MENT	LOCATION	Single
		Multiple
	PLACE	Physical facility
		Virtual environment
	MATERIAL	Static
		Evolving
	REPRESENTATION	Realistic
		Symbolic

Figure 34 – Environment dimensions of Wenzler (2008)

Location
The Indian Electricity Game is played at a single location within 2 hours of time.

Place
The place in which the game is played is a physical facility. The players use scrap paper and a whiteboard. The facilitator uses a spreadsheet for the necessary calculations. This spreadsheet can be found on the CD in the back of this report.

Material
As explained in the game dimension about interaction the game material used when designing the 12th plan is different than the material used for the design of the 13th plan. The material therefore slightly evolves during the game. However the set up of the material stays the same which classifies the material as relatively static.

Representation
The material used in the game is a folded leaflet and small cards made of paper. That material symbolizes the planning process of the five year plans which in real life is more complex.

5.4 Conclusions

In the previous chapter the design of the culture driven game design method was described. This chapter focused on the set up of the evaluation of this method. The culture driven game design method is evaluated by means of two case studies and an interview with a serious game designer in which it is examined if the method meets the requirements set in chapter 3. The functional requirements are evaluated based on the in depth results from the case studies. The non functional requirements need a judgement of a future user of the method to be able to draw conclusions. In the interview with a serious game designer, a judgement is asked on the requirement-specific data gathered in the case studies.

In the case studies the culture driven game design method is applied to adapt the Indian Electricity Game to the culture of a group of targeted players. The version of the IEG that results from the culture driven game design method is compared with the benchmark version of the IEG. The benchmark version of the game is adapted to the same group of targeted participants by applying the method of which it is known that it is able to adapt a game to the culture of the players, playtesting with these players.

The two versions of the game are compared by means of a

- Static comparison – in which the versions are compared without playing them. During this comparison the game elements that are changed and the reasons why certain game elements are changed are examined.
- Dynamic comparison – in which the versions are compared by playing them. During this comparison the cultural fit during the sessions of both versions is examined.

In order to be able to compare the two game designs by playing them, it is necessary to control the context in which the game is played. In the theoretical basis in section 1.2 it is described that a game session had three main inputs; game design, participants and configuration. It was concluded that by selecting the participants based on similar scores on a variety of characteristics as well as playing a second round with the same teams to correct the case study for player-specific behaviour, the players could be controlled. Next to the players the configurations of both versions could be controlled which made it possible to draw conclusions from the output of the sessions about the cultural fit of both game versions. Now the evaluation set up is described the next chapter presents the results of the evaluation.

CHAPTER 6 – EVALUATION RESULTS

In the previous chapter the set up of the evaluation was described. The culture driven game design method is evaluated by means of two case studies and an expert interview. In the case studies the culture driven game design method is compared with a benchmark method. The benchmark method is the method of which it is known that it is able to adapt serious games to the culture of the players; playtesting with the targeted players. In order to compare both methods two versions of the Indian Electricity Game are developed. IEG version C is the result of adapting IEG version X to the culture of the players by applying the culture driven game design method. IEG version PT is the result of adapting IEG version X by playtesting with the targeted players. IEG versions C and PT are compared in a static and dynamic comparison. This chapter presents the results of the two case studies and the expert interview.

In section 6.1 Case Study 1: CSTEP is described. In section 6.2 Case Study 2: TU Delft is described. Both sections start with the description of the adjustments that were made leading to IEG versions C and PT. When both versions are described, they are compared in a static and dynamic comparison. Each section ends with the preliminary conclusions which are drawn for both case studies. In section 6.3 the results of the case studies are combined with the expert interview to examine if the culture driven game design method meets the requirements set in chapter 3. This forms the conclusions of the evaluation of the culture driven game design method.

6.1 Case study 1: CSTEP

In this section the first case study is described. This case study is conducted at CSTEP in Bangalore, India. As explained in section 5.1.3 the two case studies are configured in such a way they are each other's complete opposites. In Case Study 1 there is a large culture difference between the playtesters and the targeted players. The playtesters were the players that played different versions of the IEG during its development. These playtesters are all employees of CSTEP working on the Next Generation Infrastructure Lab (NGIL) department. The Energy department of CSTEP provided the targeted players.

As explained in the introduction of this chapter, two versions of the Indian Electricity Game are compared. Subsection 6.1.1 describes the application of the culture driven game design method to IEG version X. The game that resulted was dubbed IEG version C. In the proceeding subsection IEG version PT is presented, the version that was adapted to the culture of the targeted players by playtesting with them. In subsections 6.1.3 and 6.1.4 the static and the dynamic comparison are described. The results of Case Study 1 are provided in the final subsection.

6.1.1 Adapting the IEG using the culture driven game design method

In this first subsection the development of IEG version C is described. As this version was adapted to the culture of the players using the culture driven game design method, the 3-step structure of this method was used to structure this subsection.

Step 1 – Assessing the culture of the players

In the first step of the culture driven game design iteration the culture of the playtesters and the targeted players is assessed using the Culture Assessment Questionnaire. The results of this culture assessment are shown in table 10.

Table 10 – CS1: Output of step 1 of the culture driven game design iteration

	PLAYERS (ENERGY GROUP)	PLAYTESTERS (NGIF GROUP)	DIFFERENCE	DIFF. LEVEL
POWER DISTANCE	26	4	22	LOW
IDENTITY	15	96	81	HIGH
GENDER	35	-35	70	HIGH
FEAR FOR THE UNKNOWN	-68	-106	38	MEDIUM
GRATIFICATION OFNEEDS	31	41	10	LOW

On the left side of table 10 the five culture dimensions of Hofstede are shown. The first column represents the aggregate results on the Culture Assessment Questionnaire of the targeted players. The second column contains the aggregate results on the questionnaire of the playtesters. The third column presents the absolute difference between the two groups of players. It is this difference that IEG version X needed to be adapted for. A final column was added with the classification of the difference on three levels. The output of step 1 shows that the targeted players have a high culture difference on the identity and gender dimensions, a medium culture difference on the *fear for the unknown* dimension and a low culture difference on the dimensions of power distance and gratification of needs.

Step 2 – Translating the culture dimensions to game elements

The results of the first step function as input for the second step of the culture driven game design iteration. The results are transferred to the Cross Dimensional Matrix. This is depicted in figure 35.

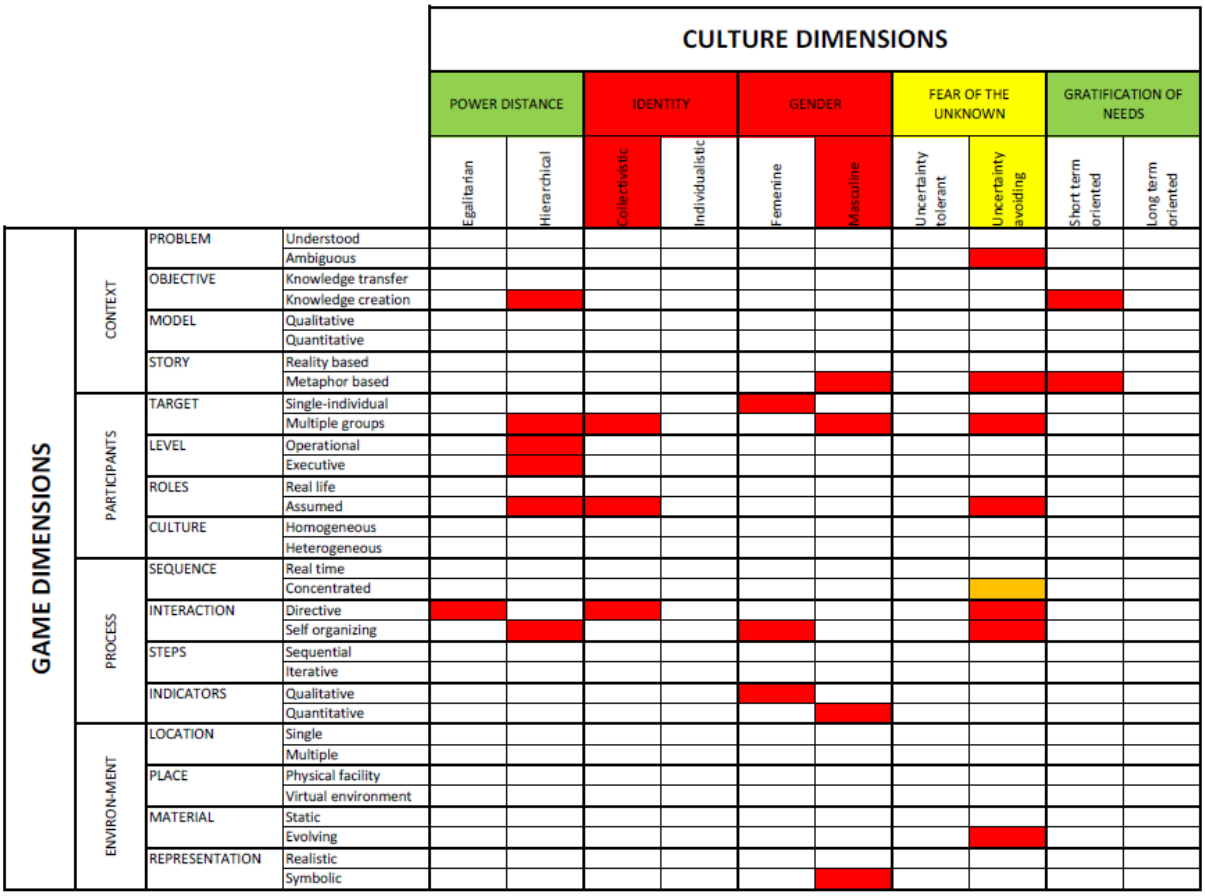

Figure 35 – CS1: The output of step 1 transferred to the Cross Dimensional Matrix

As shown in figure 35, the culture dimensions with a difference level classified as low are coloured green. As the targeted players have are far more collectivistic and masculine culture than the playtesters, these columns are coloured red. The difference on the culture dimension 'fear of the unknown' was classified as medium. Since the targeted players have a moderately more uncertainty avoiding culture, the respective column is coloured yellow.

The Cross Dimensional Matrix indicates 15 potential conflicts. Whether the game should be adapted for these potential conflicts is determined in the next step.

Step 3 – Determining the relevance of the potential conflicts
In the third step of the culture driven game design iteration the relevance of each identified potential conflict is determined. This is done by analyzing whether version X of the IEG utilizes the same game elements as in the description of the potential conflict. If this is the case, it is up to the game designer to remove, adapt or keep the game element. Step 3 of the culture driven game design iteration is extensively described in Appendix E. A summary of the results is provided here.

Of the 15 identified potential conflicts;

- 8 times there was *no conflict.* The value on the game dimension of IEG version X did not correspond with the value of the game dimension in the description of the potential conflict.
- 6 times an *adjustment* was made to IEG version X. This adjustment was necessary to avoid the conflict between the culture of the players and the game elements in IEG version X.
- 1 time *no adjustment* was made to IEG version X although a conflict was expected. The decision was made to not make an adjustment because the adjustment for another conflict solved this conflict.

A summary of the six adjustments made to IEG version X to form IEG version C is given in table 11. In the first two columns the culture dimension and the game dimension are shown. In the third column the adjustment is described and in the final column the reason for the adjustment is stated. This reason is a one sentence summary of the description in Appendix E.

Table 11 – CS1: Summary of adjustments made by culture driven game design method

	CULTURE DIM.	GAME DIM.	ADJUSTMENT	REASON
C1	Identity (collectivistic)	Target (multiple groups)	In IEG version C players choose their own teams.	Players with a collectivistic culture think of group membership as a lasting thing. If possible the incumbent groups should be respected.
C2	Gender (masculine)	Target (multiple groups)	In IEG version C it is specifically stated in the introduction that the two parallel sessions will not be compared in any way.	Players with a masculine culture can be afraid of losing the game. By removing the inter-session competition the pre game notion of losing the game is reduced.

C3	Fear of the unknown (uncertainty avoiding)	Problem (ambiguous)	In IEG version C the introduction of the challenge India faces in meeting the increasing electricity demand is explained more extensively. Next to that the extension of the introduction of the electricity challenge, the choice for the six energy sources is explained.	Players with an uncertainty avoiding culture do not like strange social situations as games can be. When the game addresses an ambiguous problems the situation becomes even more strange and uncomfortable. By extending the introduction the ambiguity surrounding the problem is reduced.
C4	Fear of the unknown (uncertainty avoiding)	Roles (assumed)	In IEG version C the players get to choose their own role.	Players with an uncertainty avoiding culture like to be well prepared. By letting them choose their own role they could pick a role that they already have certain knowledge on.
C5	Fear of the unknown (uncertainty avoiding)	Sequence (concentrated)	In IEG version C the time available for the players is extended with 5 minutes to 25 minutes per round. To ensure that the IEG remains a negotiation game, it is explicitly stated in the introduction that the players should not waste their time on discussing single MW's but instead focus on the choices that fill in the larger numbers.	Players with an uncertainty avoiding culture may resist to a game played under a high time pressure. The amount of time available is therefore increased. To ensure that the IEG remains a negotiation game the players are requested to focus on the bigger picture.
C6	Fear of the unknown (uncertainty avoiding)	Interaction (directed)	In IEG version C the facilitator is instructed to monitor the organization of interaction between the players. If the players behave in a way that indicates they need more guidance, the facilitator is instructed to emphasize the hints available in the game material.	Players with an uncertainty avoiding culture don't like strange social situations as games can be. By giving the players directions how to behave, the uncomfortable strangeness can be reduced.

The adjustments summed up in table 11 were applied to IEG version X. This resulted in IEG version C which was adapted to the culture of the targeted players by using the culture driven game design method. In the next subsection IEG version X is adapted to the targeted players by means of playtesting it with these players.

6.1.2 Adapting the IEG by playtesting with the targeted players

As stated, in this second subsection the development of IEG version PT is described. This version is adapted to the culture of the targeted players by playtesting with these players. For this playtest round the six targeted players were invited to play IEG version X simultaneously in two teams. Next to the targeted players, independent observers were invited to the sessions. Based on their observations six adjustments were made to IEG version X. The adjustments and the reasons for them are shown in table 12.

Table 12 – CS1: Summary of the adjustments made by benchmark method of playtesting

	ADJUSTMENT	REASON
PT1	In IEG version PT players choose their own teams.	One of the teams in the playtest session had severe problems in 'getting started'. First there was no player who took the initiative, later there were two people struggling for leadership. One of the independent observers thought that this difference between the two teams was caused by the team composition. It was suggested to leave the team composition to the players so the teams would have a better distribution of characters.
PT2	In IEG version PT the players get to choose their own role.	One of the players in the playtest session asked specifically if he could get the role of the Planning Commission. Since the division of roles serves no specific purpose, the independent observers suggested to let the players pick their own roles.
PT3	In IEG version PT the facilitator will make it explicit that the players will not need to calculate the status of their personal goals but they can ask the facilitator for updates.	In the testplay sessions both teams spend a lot of time calculating the ideal configurations for the five year plans. This calculating refrained the players from negotiating the causes of the problems in the Indian electricity challenge.
PT4	In IEG version PT the news paper headlines are made visual and more explicit.	The players simplified the game by disregarding all messages that concerned social costs. As a consequence all social costs were neglected in the game. By putting more emphasis on the evaluation of the social issues the players should become more aware of the consequences of disregarding them.
PT5	In IEG version PT some of the messages were made public.	As stated in adjustments PT3 and PT4 the players in the playtest session needed more guidance and more emphasis was needed on the social costs. By making some of the messages public the game provided more guidance and the decision to disregard social costs is not one made by a single player who receives a personal message, but a group decision as the message is public. It is expected that the latter reduces the ignorance of social costs in game.
PT6	In IEG version PT the time available to the players is increased with 5 minutes to 25 minutes per round.	The majority of the players complained after the playtest sessions that they had too little time for the assignments.

The adjustments summed up in table 12 were applied to IEG version X. This resulted in IEG version PT which was adapted to the culture of the targeted players by playtesting with these players.

6.1.3 Static comparison

In subsection 6.1.1 IEG version C was described. This version of the game was adapted to the culture of the players using the culture driven game design iteration. In subsection 6.1.2 IEG version PT was described. That version of the game was adapted using the benchmark method of which it is known that it is able to adapt a game to the culture of its players; playtesting with the targeted players. As argued in chapter 5; by comparing IEG version C with benchmark IEG version PT, the following statement can be tested: The culture driven game design method was able to adapt the Indian Electricity Game to the culture of different groups of players. In this subsection and the next these versions are compared, starting with the static comparison.

In the static comparison the games were compared without playing them. As explained in section 5.2.1 both IEG version C and IEG version PT originated from the same IEG version X. It is therefore that by examining the adjustments, IEG versions C and PT can be compared. During this comparison the game elements that were changed and the reasons why these game elements were changed were examined. The results of the static comparison were grouped into four categories, (I) the adjustments in version C are the same as the adjustments in version PT, (II) the adjustments in version C and version PT are different but their intention is to achieve the same goal, (III) the adjustments in version C are not made in version PT and (IV) the adjustments in version PT are not made in version C. The adjustments were distributed as following;

- Category I 3 couples of adjustments are similar (C1-PT1, C4-PT2, C5-PT6)
- Category II 5 adjustments strive for same goal (C5-PT3, C6-PT4-PT5)
- Category III 2 adjustments in version C are not made in version PT (C2, C3)
- Category IV 0 adjustments in version PT are not made in version C

The first three categories are discussed and for each category a conclusion is drawn.

Category I – Adjustments in IEG version C are the same as the adjustments in IEG version PT

Three adjustments that were made in version C were also made in version PT. These three pairs are shown in table 13. The first column shows the adjustment. The second column presents the reason why that adjustment was made in IEG version C. The third column indicates the reason why that adjustment was made in IEG version PT.

Table 13 – CS1: Reasons for similar adjustments in IEG version C and IEG version PT

	ADJUSTMENT	REASON IEG version C	REASON IEG version PT
C1 – PT1	In both versions of the IEG players choose their own teams.	Players with a collectivistic culture think of group membership as a lasting thing. If possible the incumbent groups should be respected.	One of the teams in the playtest session had severe problems in 'getting started'. First there was no player who took the initiative, later there were two people struggling for leadership. One of the independent observers thought that this difference between the two teams was caused by the team composition. It was suggested to leave the team composition to the players so the teams would have a better distribution of characters.

C4 – PT2	In both versions of the IEG the players get to choose their own role.	Players with an uncertainty avoiding culture like to be well prepared. By letting them choose their own role they could pick a role that they already have certain knowledge on.	One of the players in the playtest session asked specifically if he could get the role of the Planning Commission. Since the division of roles serves no specific purpose, the independent observers suggested to let the players pick their own roles.
C5 – PT6	In both versions of the IEG the time available to the players is increased with 5 minutes to 25 minutes per round.	Players with an uncertainty avoiding culture may resist to a game played under a high time pressure.	The majority of the players complained after the testplay sessions that they had too little time for the assignments.

As the adjustments are identical, it can be concluded that the culture driven game design method provided the same results as the benchmark method of playtesting. Regarding this category of adjustments it can therefore be concluded that the culture driven game design method was able to adjust the IEG to the culture of the targeted players.

Category II – Adjustments in IEG version C strive for the same goal as adjustments in IEG version PT
In the second category, the adjustments were grouped which are slightly different but strive for the same goal. Grouped in two combinations the adjustments in version C strive for the same goal as the adjustments in version PT.

A brief description of the two combinations:

- C5 – PT3 – In this first combination both the adjustments strive for a balanced negotiation / calculation ratio in order to ensure that the IEG remains a negotiation game instead of a calculation race. Both adjustments consist of a statement which is included in the introduction done by the facilitator. The statement in adjustment C5 is that the players should not waste their time on discussing single MW's but instead focus on the choices that fill in the larger numbers. The statement in adjustment PT3 is that the players do not need to calculate the status of their personal goals but they can ask the facilitator for updates.
- C6 – PT4 – PT5 – In the second combination all three adjustments strive for a more directed organization of interaction. If the players follow the directed interaction patterns, the behaviour and experiences of the players are predetermined. As the experiences are then known on beforehand, they can be connected back more easily to the learning objectives of the game. Adjustments PT4 and PT5 strive for a more direction organization of interaction by (PT4) making the newspaper messages visual and more explicit and (PT5) some of the messages are made public so that the players cannot strategically keep them for themselves. The adjustment in IEG version C is less thorough; the facilitator is instructed to monitor the organization of interaction between the players. If the players behave in a way that indicates they need more guidance, the facilitator is instructed to emphasize the hints already available in the game material.

The static comparison cannot conclude whether the different adjustments are able to reach the same goal to a similar extent. To do so, the game needs to be played which was done in the dynamic comparison. Observing the adjustments from a static viewpoint, it was shown that the goals of the adjustments are the same. It can therefore be concluded that the culture driven game design method identified the same needs for change as the playtest method. Regarding the second category

of adjustments it can therefore be stated that the culture driven game design method was able to adjust the IEG to the culture of the players.

Category III – Adjustments made in IEG version C are not made in IEG version PT
The third category of adjustments contains two adjustments that were made in version C but were not made in version PT.

- Adjustment C2: In IEG version C it is specifically stated in the introduction that the two parallel sessions will not be compared in any way.
- Adjustment C3: In IEG version C the introduction of the challenge India faces in meeting the increasing electricity demand is explained more extensively. Next to that the extension of the introduction of the electricity challenge, the choice for the six energy sources is explained.

It is concluded from the adjustments in category III that the culture driven game design method results in more adjustments than the benchmark method of playtesting. In the dynamic comparison it is examined if these 'extra' adjustments had a positive of negative effect on the cultural fit of the game.

Results and preliminary conclusions of the static comparison
In this subsection the static comparison of IEG version C with benchmark IEG version PT was described. The results show that each adjustment that was made in IEG version PT was also made or strived for in IEG version C. It can be concluded that the culture driven game design method can replace the playtest method and is therefore able to adapt the Indian Electricity Game to the culture of the targeted players.

6.1.4 Dynamic comparison

In the past subsection the two versions of the IEG were compared without playing them. In the dynamic comparison the cultural fit of the two versions of the IEG are compared while playing the games with the targeted players. As described in section 5.2.2 the dynamic comparison of version PT and version C consists of two rounds. From the first round the differences in behaviour between the two versions were distilled. The second round was used to correct the observed differences between the two versions for player specific behaviour.

To gather the observations questionnaires were used, the sessions were videotaped and independent observers were employed. The videos of the sessions can be found on the CD attached to the back of this report.

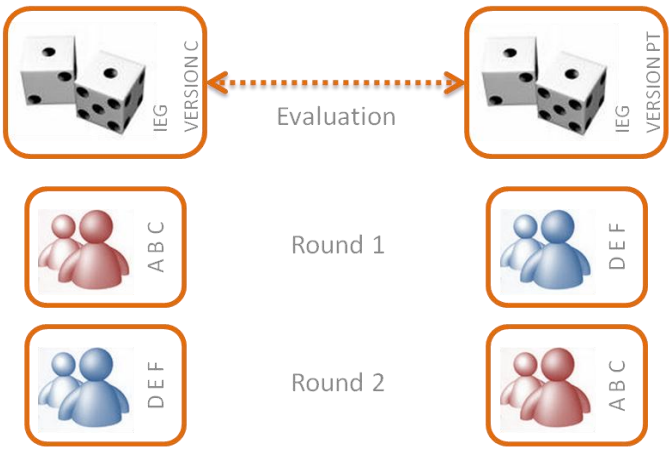

Figure 36 – The rounds in the case study evaluation

The dynamic comparison is structured by the categorization of the results of the static comparison. First the behaviour in the game caused by the similar adjustments done in version C and version PT is discussed. Next the behaviour caused by the adjustments that strive for the same goal is discussed. This is followed by a discussion on the adjustments done in version C that were not made in version PT. For each set of adjustments the cultural fit is discussed and fitted on a five point scale. This five point scale is shown in table 14.

Table 14 – Five point scale for evaluation of cultural fit

SYMBOL	MEANING
--	Detoriorated cultural fit which is worse than in the other version
-	Detoriorated cultural fit
0	No improved cultural fit
+	Improved cultural fit
++	Improved cultural fit which is better than in the other version

Category I – Adjustments in IEG version C are the same as the adjustments in IEG version PT

	Adjustment	Version C	Version PT
C1 – PT1	Team composition left to players	+	+

Both version C and version PT were adjusted by leaving the team composition to the six players of the game. When all six players of round 1 arrived in the room in which both versions of the game were played, they were asked to group into two teams. The players chose to team up in similar teams as during the test play round. The same happened in round 2 in which the players chose to team up again in similar teams.

In the post-game interviews the players stated that the reason to team up in similar teams as previous rounds was predominantly convenience. When playing in the same team composition they knew what experience the other players had from the previous round. This was convenient to know in the negotiations for this round.

Since the players consciously used the option to choose their own team to increase their convenience, it can be concluded that this adjustment improved the cultural fit of both versions.

	Adjustment	Version C	Version PT
C4 – PT2	Choice of roles left to players	+	+

Both version C and version PT were adjusted by leaving the choice for a role to the players of the game. Halfway the introduction the players were asked to each choose a role. Players in both teams chose different roles when compared to the roles in the test play round. The same happened in round 2 in which some of the players again chose different roles.

According to the observers interpretation the players had various reasons to choose a different role compared to previous rounds. Some players chose a specific role since they expected a better chance to get a good performance in the game when playing that role. Other players expected to be in the driver's seat when choosing the Planning Commission role since the Planning Commission officially heads the composition of the two five year plans. Whatever the specific reason, each of the players chose a role in order to increase their comfort with the game.

Since the players consciously used the option to choose their own roles to increase their comfort with the game, it can be concluded that this adjustment improved the cultural fit of both the versions.

	Adjustment	Version C	Version PT
C5 – PT6	Increased play time	+	+

Both version C and version PT were adjusted by increasing the time available in each round from 20 minutes to 25 minutes. In round 1 both teams still experienced a high time pressure. This was no different in round 2. In both rounds and with both teams the facilitator needed to summon the players to hand in their final five year plan.

In the post-game interviews the players stated that the time pressure was still high but they were more comfortable playing the game for the second time. This is in line with the conclusions of the independent observers who stated that time pressure was hard to measure because of the experience the players gained while playing the test play round. However, according the interpretation of the observers the extra time provided was a necessary adjustment in order for the players to make conscious instead of rushed choices.

Based on the interpretation of the observers it is concluded that the adjustment to increase the time available improved the cultural fit of both versions.

Category II – Adjustments in IEG version C strive for the same goal as adjustments in IEG version PT

	Adjustment	Version C	Version PT
C5 – PT3	Balanced calculation - negotiation ratio	+	+

In both version C and version PT adjustments were made striving for a balanced calculation – negotiation ratio. In both versions these adjustments consisted of an extension of the introduction by stating in different ways that the players should focus on the negotiation. In the first round, the amount of time spend on calculating the optimal composition of the five year plans decreased, compared to the playtest round. According to the observers the calculation – negotiation ratio was about 75% - 25% for both version C and version PT in the first round. This ratio did not change in the versions played in the second round.

Since the players spend less time on calculating the optimal composition of the five year plans when compared to the playtest round it can be concluded that the adjustments resulted in the intended behaviour providing game outcomes which are useful in the discussion during the debriefing. As the adjustments independently made to version C and version PT resulted in the same intended behaviour in both rounds, it can be concluded that the cultural fit of both games equally improved.

	Adjustment	Version C	Version PT
C6 – PT4 – PT5	More directed organization of interaction	+	+

In both version C and version PT adjustments were made striving for a more directed organization of interaction. In version C the facilitator is instructed to provide more structure to the players when their behaviour indicates they need more guidance. In version PT new game elements are introduced that structure the interaction between the players.

How to organize the interaction is a stringent issue when playing a game for the first time. In proceeding plays of that game the organization of interaction will largely be based on the organization of the first play. From the sessions in round 1 and 2 it can be concluded that the players needed less time to structure the organization of interaction. From these observations and

interviews it is however not possible to conclude whether this is the result of the adjusted versions of the game or the result of the experience the players had from the play test round.

This leaves the interpretation of the independent observers in order to conclude whether the adjustments improved the cultural fit of the game. The observers conclude that both versions of the game have an improved cultural fit. The instructions for the facilitator in version C were more than welcome since it provided more freedom to the facilitator to tailor the game to the players. In version PT the extension of the newspaper headlines and the introduction of public messages provided the facilitator with more tools to steer the players towards a preferred interaction pattern. It is therefore concluded that the adjustments made to both version C and version PT provide the tools to the facilitator to improve the cultural fit of the game.

Category III – Adjustments made in IEG version C have not been made in IEG version PT

	Adjustment	Version C	Version PT
C2	Extensive introduction	++	0

In IEG version C the introduction was adjusted by providing the players with a more extensive briefing on the Indian electricity challenge and the choices made regarding the energy sources. This adjustment was not made in IEG version PT. It was hard to determine whether the extended briefing improved the cultural fit of version C because the players in both teams already played the game in the test play round. When asked upon, the players preferred the extended briefing over the normal briefing. This conclusion was shared by the observers. This leads to the conclusion that the extensive briefing of version C improved the cultural fit of version C in comparison with the normal briefing of versions X and PT.

	Adjustment	Version C	Version PT
C3	Reduced competition between teams	0	0

In IEG version C the amount of competition was reduced by specifically stating that the two parallel sessions in a round would not be compared. It should be noted that only the statement is the adjustment in version C, in none of the versions a comparison between the teams is made. However, after the game was played the players asked the other teams what their scores and strategies were. It can therefore be concluded that the reducing the amount of competition did not improve nor deteriorated the cultural fit of the game.

Results and preliminary conclusions of the dynamic comparison

In the dynamic comparison of version C and version PT the behaviour was analyzed that resulted from the adjustments made forming the two versions. In the table below the results of the dynamic comparison are summarized.

Table 15 – Five point scale for evaluation of cultural fit

SYMBOL	MEANING
--	Deteriorated cultural fit which is worse than other version
-	Deteriorated cultural fit
0	No improved cultural fit
+	Improved cultural fit
++	Improved cultural fit which is better than in other version

Table 16 – CS1: Evaluation adjustments

Category I – Adjustments same in both versions		Version C	Version PT
C1 – PT1	Team composition	+	+
C4 – PT2	Choice of roles	+	+
C5 – PT6	Increased play time	+	+
Category II – Adjustments same in both versions		**Version C**	**Version PT**
C5 – PT3	Balance calculation - negotiation ratio	+	+
C6 – PT4 – PT5	More directed organization of interaction	+	+
Category III – Adjustments made in version C, not in version PT		**Version C**	**Version PT**
C2	Extensive introduction	++	0
C3	Reduced competition between teams	0	0

Table 16 shows that the same adjustments done in both versions of the game worked out equally in the evaluation experiment. The adjustments made striving for the same goal were different for both versions but resulted in a comparable improvement in the cultural fit of the game. The final category, the adjustments only made in version C, contained two adjustments of which one resulted in an improvement of the cultural fit and the other did not result in adjusted behaviour.

The results of the dynamic comparison show that IEG version C had a slightly better cultural fit than IEG version PT. As IEG version PT was adjusted to the culture of the players by using the benchmark method of play testing with the targeted players, it can be concluded that the culture driven game design method was able to adjust the IEG to culture of the targeted players in this first case study.

6.1.5 Reflections and results of Case Study 1

In this subsection the reflections and results of Case Study 1 are presented. Looking back at the first case study two remarks need to be made regarding the culture dimensions and the disturbing effect of experience.

As stated in the introduction of this section the case studies were configured in such a way they are each other's complete opposites. In Case Study 1 there was a large culture difference between the playtesters and the targeted players. However, this large culture difference did not stretch over all five culture dimensions. The playtesters and the targeted players scored different at three culture dimensions. Two culture dimensions have therefore not been tested; power distance and the gratification of needs. For the latter this is less a problem since only 2 of the 27 potential conflicts are identified in that dimension. This opposed to the power distance dimension in which seven potential conflicts are identified. (See Figure 35 on page 75.) The situation in which two culture dimensions could not be tested was inevitable given the available players. As described in section 5.2.2, the targeted players were selected based on many characteristics including their scores on the CAQ. The players selected were a homogeneous group which differed maximally from the playtesters. The maximum difference for this case study was a large difference at three out of the five culture dimensions. This remark is acknowledged and further discussed in the reflection on the evaluation in subsection 7.2.2

The second remark is about the disturbing effect of experience in Case Study 1. Round 1 and 2 in the case study were preceded by a playtest round in which IEG version X was played by the targeted participants. The output of this round was necessary to create the benchmark version PT. However, the experience gained in this playtest round made it not possible to observe the cultural fit of two adjustments made in version C and PT. This was solved by using the interpretations of the independent observers. In order to improve further evaluation experiments it is recommended to construct a game that is less sensitive to experience.

With the reflections stated, the conclusions from Case Study 1 can be drawn. In Case Study 1 the culture driven game design method was evaluated using a group of targeted players that were selected based on a culture difference that was as large as possible compared to the playtesters. The static comparison showed that each adjustment made in benchmark version PT was also made, or strived for, in IEG version C. These results were confirmed in the dynamic comparison. After playing the game with two teams of targeted players over two rounds it was concluded that IEG version C had a slightly better cultural fit than IEG version PT. As IEG version PT is adjusted to the culture of the players by using the benchmark method of play testing with the targeted players, it can be concluded that the culture driven game design method was able to adjust the IEG to culture of the targeted players in this first case study.

6.2 Case Study 2: TU Delft

In this section the second case study is described. This case study was conducted at the Delft University of Technology in the Netherlands. As explained in section 5.1.3 the case studies are configured in such a way they are each other's complete opposites. In Case Study 1 there was a large culture difference between the playtesters and the targeted players. In Case Study 2 the targeted players were selected based on a culture difference that was as small as possible. From a group of 11 students, six were selected that formed a homogeneous group with a score on the CAQ that was closest to the score of the playtesters. As stated, the playtesters were the players that played different versions of the IEG during its development. These playtesters were all employees of CSTEP working on the Next Generation Infrastructure Lab (NGIL) department. The six selected students of the TU Delft formed the group of targeted players.

As explained in the introduction of this chapter, two versions of the Indian Electricity Game are compared. Subsection 6.2.1 describes the application of the culture driven game design method to version X of the IEG. The game that resulted was dubbed IEG version C. In the proceeding subsection IEG version PT is presented, the version that was adapted to the culture of the targeted players by play testing with them. The results of the static and dynamic comparison as well as the conclusions of Case Study 2 are presented in subsection 6.2.3

6.2.1 Adapting the IEG using the culture driven game design method

In this first subsection the development of IEG version C is described. As this version was adapted to the culture of the players using the culture driven game design method, the 3-step structure of this method was used to structure this subsection.

Step 1 – Assessing the culture of the players

In the first step of the culture driven game design iteration the culture of the playtesters and the targeted players is assessed using the Culture Assessment Questionnaire. The results of this culture assessment are shown in table 17.

Table 17 – CS2: Output of step 1 of the culture driven game design iteration

	PLAYERS (TU DELFT STUDENTS)	PLAYTESTERS (NGIL GROUP)	DIFFERENCE	DIFF. LEVEL
POWER DISTANCE	-26	4	30	LOW
IDENTITY	58	96	38	MEDIUM
GENDER	23	-35	58	MEDIUM
FEAR FOR THE UNKNOWN	-112	-106	5	LOW
GRATIFICATION OFNEEDS	9	41	32	LOW

On the left side of table 17 the five culture dimensions of Hofstede are shown. The first column represents the aggregate results on the Culture Assessment Questionnaire of the targeted players. The second column contains the aggregate results on the questionnaire of the playtesters. The third column presents the absolute difference between the two groups of players. It is this difference that IEG version X needs to be adapted for. A final column was added with the classification of the difference on three levels. The output of step 1 shows that only two culture dimensions are classified as medium, whereas the other are classified as low.

Step 2 – Translating the culture dimensions to game elements

The results of the first step are the input for the second step of the culture driven game design iteration. The results are transferred to the Cross Dimensional Matrix as depicted in figure 37.

				CULTURE DIMENSIONS									
				POWER DISTANCE		IDENTITY		GENDER		FEAR OF THE UNKNOWN		GRATIFICATION OF NEEDS	
				Egalitarian	Hierarchical	Collectivistic	Individualistic	Feminine	Masculine	Uncertainty tolerant	Uncertainty avoiding	Short term oriented	Long term oriented
GAME DIMENSIONS	CONTEXT	PROBLEM	Understood										
			Ambiguous										
		OBJECTIVE	Knowledge transfer										
			Knowledge creation										
		MODEL	Qualitative										
			Quantitative										
		STORY	Reality based										
			Metaphor based										
	PARTICIPANTS	TARGET	Single-individual										
			Multiple groups										
		LEVEL	Operational										
			Executive										
		ROLES	Real life										
			Assumed										
		CULTURE	Homogeneous										
			Heterogeneous										
	PROCESS	SEQUENCE	Real time										
			Concentrated										
		INTERACTION	Directive										
			Self organizing										
		STEPS	Sequential										
			Iterative										
		INDICATORS	Qualitative										
			Quantitative										
	ENVIRON-MENT	LOCATION	Single										
			Multiple										
		PLACE	Physical facility										
			Virtual environment										
		MATERIAL	Static										
			Evolving										
		REPRESENTATION	Realistic										
			Symbolic										

Figure 37 – CS2: The output of step 1 transferred to the Cross Dimensional Matrix

As shown in figure 37, the three culture dimensions with a difference level classified as low are coloured green. The difference on the culture dimensions *identity* and *gender* were classified as medium. Since the targeted players have a moderately more collectivistic and masculine culture, the respective columns are coloured yellow.

The Cross Dimensional Matrix indicates 7 potential conflicts. Whether the game should be adapted for these potential conflicts is determined in the next step.

Step 3 – Determining the relevance of the potential conflicts

In the third step of the culture driven game design iteration the relevance of each identified potential conflict is determined. This is done by analyzing whether version X of the IEG utilizes the same game elements as in the description of the potential conflict. If this is the case, it is up to the game designer to remove, adapt or keep the game element. Step 3 of the culture driven game design iteration is extensively described in Appendix F. A summary of the results is provided here.

Of the 7 identified potential conflicts;

- 5 times there was *no conflict.* The value on the game dimension of IEG version X did not correspond with the value of the game dimension in the description of the potential conflict.
- 1 time an *adjustment* was made to IEG version X. This adjustment was necessary to avoid the conflict between the culture of the players and the game elements in IEG version X.

- 1 time *no adjustment* was made to IEG version X although a conflict was expected. The decision was made to not make an adjustment because the adjustment for another conflict solved this conflict.

The adjustment made to IEG version X to form IEG version C is given in table 18. In the first two columns the culture dimension and the game dimension are shown. In the third column the adjustment is described and in the final column the reason for the adjustment is stated. This reason is a one sentence summary of the description in Appendix F.

Table 18 – CS2: Summary of the adjustments made by the culture driven game design method

	CULTURE DIM.	GAME DIM.	ADJUSTMENT	REASON
C1	Identity (collectivistic)	Target (multiple groups)	In IEG version C players choose their own teams.	Players with a collectivistic culture value think of group membership as a lasting thing. If possible the incumbent groups should be respected.

With the results of the culture driven game design iteration applied to IEG version X, IEG version C was created. In Case Study 2 the only difference between these versions is the team composition which is left to the players. In the next subsection IEG version X is adapted to the culture of the targeted players by means of playtesting it with these players.

6.2.2 Adapting the IEG by playtesting with the targeted players

As mentioned, in this subsection the development of IEG version PT is described. This version was adapted to the culture of the targeted players by playtesting IEG version X with these players. Based on the observations and the post game discussion with the targeted players no need for adjustments was identified. A summary of both the observations and the post game discussion of the playtest round is given here, whereas the video of the post game discussion can be found on the CD attached to the back of this report.

From the observations it can be concluded that the playtest round resulted in similar behaviour as in earlier sessions played during the development of the IEG. Two important similarities are discussed here. The first similarity between the playtest round and earlier sessions was that both teams briefly discussed the social costs in the game. As there was no quantification method nor an evaluation moment scheduled for social performance of the five year plans, the players consciously decided to disregard social costs. This conscious decision provides a good player experience that can function as the basis for the debriefing of social costs. Because of this the game did not need be adjusted in order to emphasize the importance of social costs.

Another similarity between the playtest round and earlier sessions was that the targeted players in both teams spend more time on negotiating than on calculating during the sessions. As both teams exhausted most of the options in the 12th plan, the planning for the 13th plan was characterized as crisis management. It was interesting to see that the two teams handled this crisis very differently. Team 1 spend most of their time on calculating the best possible plan given their constraints. Team 2 on the opposite, engaged in a discussion on the causes of their limited possibilities for the 13th plan. However, since both teams negotiated the majority of the time available for the 12th plan and were both well aware of the causes of the constraints in the 13th plan, no adjustment needed to be made to change the negotiation – calculation ratio.

Just as the observations did not provide a reason to change the game, neither did the post game discussion. The discussion was focused on game content rather than game design. Also when the discussion was directed to changes in game design the questions and suggestions were about the energy sources, the values of the parameters in the game and the other factors that play a role in the Indian electricity challenge. It is therefore concluded that regarding the culture of the players IEG version X did not need to be changed. This result implicates that in Case Study 2 IEG version X was identical to IEG version PT.

6.2.3 Reflections and results of Case Study 2

As explained in the introduction of this section, the case studies in the evaluation were configured in such a way they are each other's complete opposites. In Case Study 1 there was a large culture difference between the playtesters and the targeted players. In Case Study 2 the targeted players were selected based on a culture difference that was as small as possible. As shown in subsection 6.2.1 a small difference between the playtesters and the targeted players existed. Using the culture driven game design method, this small difference resulted in one adjustment in IEG version C. In the playtest round no needs for adjustments were identified. As only one adjustment was made, the results of the static and dynamic comparison are discussed in this subsection. After the discussion of the results the conclusions are drawn regarding Case Study 2.

In the static comparison IEG version C was compared with benchmark version PT without playing them. It is concluded that the culture driven game design method resulted in one adjustment that was not made using the benchmark method of playtesting. Regarding the static comparison it can therefore be concluded that the culture driven game design method can replace the testplay method and is thereby able to adapt the Indian Electricity Game to the culture of the targeted players.

The dynamic comparison is not executed since versions C and PT differed by only one adjustment; team composition. In version C the teams were chosen by the players themselves instead of the facilitator determining the teams in version PT. Because this was the only difference the players were asked if they had any preference in team composition. The collective answer revealed that they had no preference. It is therefore assumed that the adjustment in version C would not lead to different behaviour when both games would be played.

With the results of both comparisons stated, the conclusions of Case Study 2 can be drawn. In Case Study 2 the culture driven game design method was evaluated using targeted players that were selected based on a culture difference that was as small as possible compared to the playtesters. The results of the static and the dynamic comparison show that the culture driven game design method provided similar results as the play test method. As the playtest method is the benchmark method, it can be concluded that the culture driven game design method was able to adjust the IEG to the culture of the players in Case Study 2.

6.3 Results and conclusions

In the past two sections the case studies were described. Next to those case studies an expert interview was conducted with a serious game designer. In this section the results of these case studies and the interview are combined to examine if the culture driven game design method meets the requirements set in chapter 3. For each requirement a conclusion is presented. Using these conclusions the culture driven game design method is evaluated by examining if the main requirement is met.

A.1 – The method must be applicable to all types of serious games
The culture driven game design method is set up for both analogue and digital serious games. In the development of the method the Triadic Game Design development model is used as the foundation. The TGDdm is applicable to both analogue and digital games. Next to that, the suggestions made in the culture driven game design iteration can also be applied to both analogue and digital games. It can be concluded that the culture driven game design method is designed to be applicable to all types of serious games.

In the evaluation both the case studies were executed using the analogue Indian Electricity Game. The IEG is an analogue game combining role play with board gaming. As the culture driven game design method is not evaluated using digital serious games as well, it cannot be concluded from these case studies that the culture driven game design method is applicable to all types of serious games. It can only be concluded that the results of both case studies showed that the culture driven game design method was applicable to the IEG. Further research should indicate whether the method is applicable to other analogue and digital serious games.

A.2 The method must be applicable to all types of cultures
In the development of the culture driven game design method the theory of Hofstede was selected to assess the culture of the players. The theory of Hofstede does not exclude any type of culture. Instead it intends to compare any culture by scoring them on five independent dimensions.

Based on their scores on these culture dimensions the targeted players were selected in such a way two complete opposite case studies were formed. In Case Study 1 there was a large culture difference between the playtesters and the targeted players. In Case Study 2 there was a small culture difference. In this set up the culture driven game design method is tested on 2 different cultures. As both case studies showed positive results it can be concluded that the culture driven game design method is applicable to multiple types of cultures.

As discussed, not all culture dimensions could be evaluated. Two culture dimensions could not be tested. It is therefore that it cannot be concluded that the method is applicable to all types of cultures. Further research should indicate whether the method is applicable to cultures differing on the final two dimensions as well.

A.3 The method must not include playtesting with the targeted players
Neither in the development, nor in the case study evaluation, playtesting was included in the culture driven game design method.

A.4 The method must be able to adapt serious games to the culture of the players
In the case studies the culture driven game design method was compared with a benchmark method. The benchmark method was the method of which it was known that it is able to adapt serious games to the culture of the players; playtesting with the targeted participants. In order to compare both methods two versions of the Indian Electricity Game were developed. IEG version C was adapted using the culture driven game design method. IEG version PT was the result of the known way to adapt version X to the culture of the players. These two versions of the IEG are compared in a static and dynamic comparison. The results of both case studies are briefly stated here.

The static comparison in Case Study 1 showed that each adjustment made in benchmark version PT was also made or strived for in IEG version C. These results were confirmed in the dynamic comparison. After playing the game with two teams of targeted players over two rounds it was concluded that IEG version C had a slightly better cultural fit than IEG version PT. As IEG version PT was adjusted to the culture of the players by using the benchmark method of playtesting with the

targeted players, it was concluded that the culture driven game design method was able to adjust the IEG to culture of the targeted players in this case study 1.

In the second case study the results of the static and the dynamic comparison showed that the culture driven game design method provided similar results as the playtest method. As the playtest method is the benchmark method, it is concluded that the culture driven game design method is able to adjust the IEG to the culture of the players in Case Study 2.

Combing the results of the two case studies it is concluded that the culture driven game design method is able to adapt the IEG to the culture of the targeted players. As stated, further research is needed to evaluate the culture driven game design method for other types of serious games.

B.1 The amount of time needed by the serious game designers to apply the method should be minimized
The culture driven game design method comes with a clear cut manual, describing step by step the actions a serious game designer needs to take. Next to that the Culture Assessment Questionnaire and the spreadsheet needed to gather and process the input are made available. These measures intended to minimize the time needed by the serious game designer to apply the culture driven game design method.

Applying the culture driven game design method took half a day in each case study. The combined eight hours of work were mainly filled with getting the CAQ's filled in by the 42 playtesters and targeted players. The rest of the time was used for filling in the questionnaire results and determining the relevancy of the potential conflicts in step 3 of the method.

The two issues that influence time consumption surfaced during the interview. (1) It should be noted that the size of the game plays a role in how much time is needed to adapt the game to the players' culture. (2) Time is needed to assemble a representative group of players. Having noted these issues the interviewed serious game designer regarded a half a day work to adapt his game to the culture of the players very acceptable.

B.2 The amount of time need for the client of the serious game designer to provide the input should be minimized
The culture driven game design method uses the CAQ to gather the input of the targeted players. 66% of the people that filled in the CAQ was able to finish within 5 minutes. The remaining 34% did not need more than 10 minutes to fill in questionnaire. The serious game designer indicated in the interview that without a doubt he would ask the targeted players to fill in the 10-minute questionnaire. It is concluded that the amount of time needed of the client to provide the input is limited to a very acceptable level.

B.3 The costs to apply the method should be minimized
Besides the manual, the culture driven game design method consists of a questionnaire and a spreadsheet in which the results of the questionnaire are processed. As these materials are all accessible with open source software, it can be concluded that no extra costs are made in applying the method but the time spend by the serious game designer. The interviewee confirmed this conclusion.

B.4 It should be possible to apply the method without any knowledge of theory on culture
In the first step of the culture driven game design method the culture of the players is assessed using the CAQ and a spreadsheet. As the CAQ and the spreadsheet are available to the serious game designer no knowledge on theory on culture is needed in this step. In the second step of the method the values of the culture dimensions are translated to potential conflicts accompanied with

suggestions to mitigate the conflicts. Also the second step is pre-programmed by providing the Cross Dimensional Matrix.

In the third step the serious game designer needs to interpret his game with respect to the potential conflict sketched in the method. This interpretation requires some empathy of the game designer with the culture dimensions. However, by including a description of why a certain culture dimension may result in a conflict when combined with certain game elements, the amount of upfront knowledge on theory on culture is reduced to a minimum.

In addition to this conclusion the interviewee noted that the one culture dimension is easier to understand than the other. However when the interviewee was provided with some potential conflicts, he concluded that the theory needed was available in the description. It is therefore concluded that it is possible to apply the culture driven game design method without any knowledge on theory on culture.

C.1 The method should provide an overview of the culture of the players
The culture driven game design method provides an overview of the culture of the players in the output of step 1. The output table shows the scores of the playtesters and the targeted players on each of the five culture dimensions.

It took the interviewed serious game designer a few minutes to understand the overview of the players' culture. As stated in the evaluation of the previous requirement the one culture dimensions is easier to understand than the other. The serious game designer suggested to create some stereo types for certain configuration on the five dimensions. Although these stereotypes may help to interpret the overview the idea was rejected. Stereotyping is one of the causes of culture related problems. When using stereotypes, people are judged on the characteristics of the stereotypes instead of their own characteristics. Since the interpretation of stereotypes differs per person, the use of it would stimulate the formation of a wrong image of the group of targeted players. It is therefore concluded that the overview of the players' culture is accurate but may require some time to be interpreted.

C.2 The method should provide an overview of the critical factors
The culture driven game design method provides an overview of the critical factors in the output of step 2. The Cross Dimensional Matrix presents an overview of all potential conflicts, including an indication of the need to mitigate these conflicts.

According to the interviewee the representation of the potential conflicts is clear. A suggestion to improve the overview is to cut out the culture-insensitive dimensions. As the proportion of potential conflicts in the Cross Dimensional Matrix would increase, this would also increase the sense of urgency of the serious game designer to adapt his game to the culture of the players.

This suggestion is noted for the further development of the culture driven game design method. It is concluded that the culture driven game design method provides a clear overview of the critical factors by means of the Cross Dimensional Matrix.

C.3 The method should provide suggestions how to deal with the identified critical factors
The culture driven game design method provides for each potential conflict one or more suggestions to mitigate the conflict. However these are only suggestions. In some cases the potential conflict may be solved by adjusting or removing another game element. This is up to the game designer.

Although most of the suggested game elements were open doors, the serious game designer regarded them useful. It shows that the solution in mitigating the potential conflict may be closer

than expected. The designer agrees on the statement it is difficult to come up with suggestions since each game is unique. It is concluded that the culture driven game design method provides useful suggestions in how to mitigate the identified potential conflicts.

Now the culture driven game design method is evaluated regarding all requirements, table 19 provides an overview of conclusions regarding each requirement. The first two columns include the functional requirements (A-numbers), constraints (B-numbers) and the quality requirements (C-numbers). The third column indicates the evaluation instrument used. The final column provides the conclusion.

Table 19 – Conclusions per requirement

	REQUIREMENT	EVALUATED BY	CONCLUSION
A.1	The method must be applicable to all types of serious games.	Case Studies	The method is applicable to the analogue IEG. Further research is needed for evaluation of all types of serious games.
A.2	The method must be applicable to all types of cultures.	Case Studies	The method is applicable to multiple types of cultures. Further research is needed for evaluation of all types of cultures.
A.3	The method must not include playtesting with the targeted players.	Case Studies	The method does not include playtesting. Requirement is met.
A.4	The method must be able to adapt serious games to the culture of the targeted players.	Case Studies	The method is able to adapt the IEG to the culture of the targeted players. Further research is needed to evaluate the functioning of the method for other types of serious games.
B.1	The amount of time needed by the serious game designer to apply the method should be minimized.	Case Studies + Interviews	In the case studies the method was applied in four hours. The interviewee regarded this very acceptable. The requirement is met.
B.2	The amount of time needed for the client of the serious game designer to provide input should be minimized.	Case Studies + Interviews	The time needed of a targeted player is limited to 10 minutes. The interviewee regarded this very acceptable. The requirement is met.
B.3	The costs to apply the method should be minimized.	Case Studies + Interviews	No extra costs but the time spend by the serious game designer are made when applying the method. Considering the time needed to apply the method, the interviewee regarded this very acceptable. The requirement is met.
B.4	It should be possible to apply the method without any knowledge of theory on culture.	Case Studies + Interviews	The limited amount of knowledge needed of theory on culture is supplied when needed in the manual of the method. The interviewee regarded this very acceptable. The requirement is met.
C.1	The method should provide an overview of the culture of the players.	Case Studies + Interviews	The method provides an overview of the culture of the players by means of the output table of step 1. This overview is accurate but may take some time to interpret. The requirement is met.
C.2	The method should provide an overview of the critical factors.	Case Studies + Interviews	The method provides an overview of the potential conflicts in the Cross Dimensional Matrix including an indication of the need to mitigate there conflicts in step 2. The interviewee regarded this overview as clear. The requirement is met.
C.3	The method should provide suggestions how to deal with the identified factors.	Case Studies + Interviews	The method provides one or more suggestions for each potential conflict. The interviewee regarded the suggestions useful. The requirement is met.

Based on the conclusions summarized in table 19, it is examined if the culture driven game design method meets the main requirement; *The method must be able to adapt serious games to the culture of the targeted players without playtesting them with these players.* The following conclusion is drawn, which is directly the conclusion of the evaluation of the culture driven game design method:

Regarding the functional requirements it is concluded that the culture driven game design method was able to adapt the IEG to multiple groups of players with a different culture without playtesting the game with these players. This was possible while meeting all the constraints and quality requirements that were set. However, further research is needed to evaluate if the method is also applicable to other types of serious games and other types of cultures.

CHAPTER 7 – DISCUSSION AND REFLECTION

In the past chapters the culture driven game design method was developed and evaluated. In the previous chapter the results of the evaluation were presented. In this chapter the results and the process that led to these results are discussed. In the first section (7.1) the result of this research, the culture driven game design method, is discussed. In the second section (7.2) the process that led to the result is reflected upon.

7.1 Discussion

In this section the result of this research, the culture driven game design method, is discussed. For this discussion two issues were chosen. First, the implications were discussed of the relatively small amount of literature available for the translation of the culture dimensions into the game elements in step 2. This was considered the main limitation of the current version of the method. Second the functioning of the culture driven game design iteration apart from the TGDdm is discussed. This was considered the main opportunity of the current version of the method.

7.1.1 Lacuna in literature on translation of the culture dimensions into game elements

In section 4.3 it is acknowledged that a relatively small amount of literature was available for providing the theory that forms the final stepping stone in the translation of culture dimensions into the game elements. The reason for this lacuna in literature available is probably similar to the reason why the number of game design methods is limited. Serious game design is compared to other design sciences a young discipline (Mayer, 2010; Salen & Zimmerman, 2004). Due to the young age of the discipline of serious game design the body of knowledge is relatively small.

Although the case studies in this research did not suggest that this translation is incomplete, it can be improved when this body of knowledge is enriched. This enrichment can come from field studies, experiments, case studies etc. During these activities the culture driven game design method should be used to adapt various serious games to the culture of their players. In this way the activities create utility (the used game is adapted to the players' culture) and knowledge (the experience gained contributes to the existing knowledge base). This set up for further research complies with the design science paradigm as described by (Hevner, et al., 2004).

This leads to the first recommendation for further research: Although the case studies in this research did not suggest that the translation of culture dimensions into game elements is incomplete, it can be improved when the body of knowledge regarding this issue is enriched by means of activities structured along the design science paradigm.

7.1.2 Culture driven game design iteration can be independent of TGDdm

The second point of discussion is about the functional necessity of embedding the culture driven game design iteration in the Triadic Game Design development model. As described in chapter 4, the culture driven game design method consist of the culture driven game design iteration embedded in the TGDdm. From an evaluation point of view, embedding the culture driven game design iteration in a serious game design method was necessary. Due to a limited amount of case studies that could be executed it was not possible to evaluate the culture driven game design method if variations would be made in the serious game design method in which the iteration was embedded. However, from a functional point of view it is questionable whether embedding the culture driven game design iteration in the TGDdm was necessary.

The TGDdm was selected to function as the foundation of the culture driven game design method for two reasons; (1) An agile method was preferred over a waterfall method because agile method, like other soft systems methods, are able to cope with the socio-political complexity of complex multi-actor systems and (2) the TGDdm is applicable to both analogue and digital serious games. Of these reasons there is only one that enforces the culture driven game design iteration in supporting serious game designers in adapting their games to the culture of their players; agility. The second reason is only ensuring the applicability of the culture driven game design method to all types of serious games.

So if the culture driven game design iteration is embedded in an agile serious game design method no functionality should theoretically be lost. To evaluate this, the culture driven game design iteration should be tested in further research when embedded in agile serious game design methods other than the TGDdm. This is the second recommendation for further research. To provide the first step in this research a manual for the use of the culture driven game design iteration is assembled with can be found on the CD attached to the back of this report.

7.2 Reflection

In the previous section the result of this research, the culture driven game design method, was discussed. In this section the process that led to this result is reflected upon. In subsection 7.2.1 the research method is reflected upon followed by a reflection on the evaluation in subsection 7.2.2. In the final subsection, 7.2.3, a personal reflection is stated.

7.2.1 Reflection on research method

The research method for this project was formed by combining two existing research methods; the META model of (Herder & Stikkelman, 2004), and the spiral model of (Boehm, 1986). The research method is depicted in figure 38.

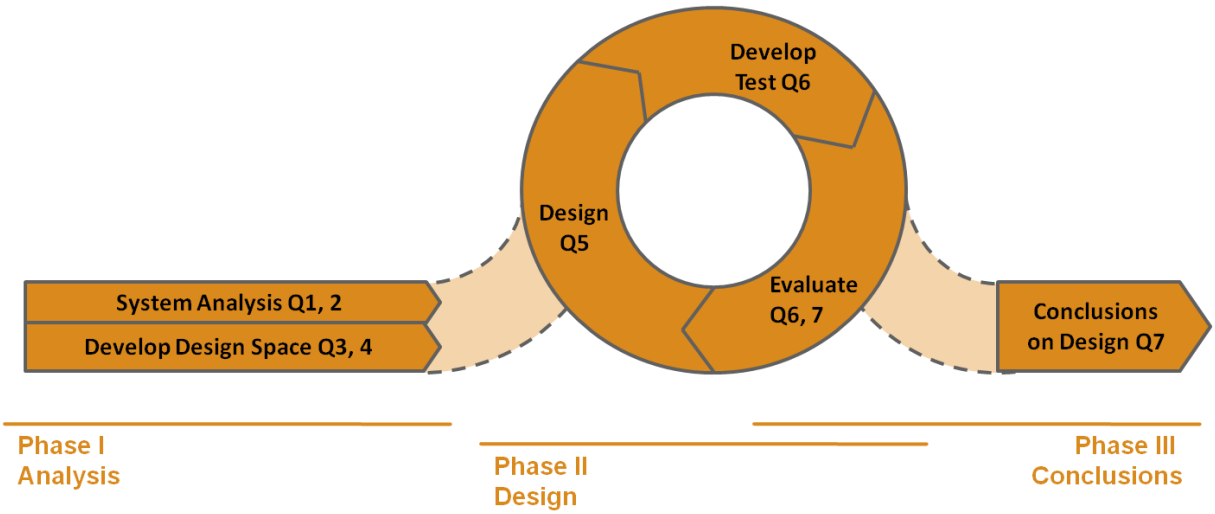

Figure 38 – The research method

As shown in Figure 38 three phases were distinguished. In this reflection on the research method these three phases are used as the structure.

Phase I – Analysis

In the first phase the META model was leading. In the system analysis multiple SGD methods were analyzed on how they support serious game designers in adapting their games to the culture of the players. The system analysis provided valuable results; the problem as sketched in chapter 1 was confirmed and valuable insight was gained on the construct of SGD methods.

Next to the system analysis, the design space was set in the first phase of this research. First a SGD method was selected to function as the foundation of the culture driven game design method. Second, the requirements were set which provided guidelines during the development and a structure for the evaluation of the culture driven game design method.

In the research method the design space was set before the development of the method was started. In practice, insights gained during the design led to refinements of the system analysis and design space. It can therefore be concluded that the research method missed a feedback loop from the design phase back to the analysis phase.

Phase II – Design

In the second phase the spiral model of Boehm was leading. The reason that the spiral model of Boehm was selected is that this model emphasizes the importance of the development of tests. This was confirmed in the research process. A relative large share of the energy put in this project was

allocated to the set up of the evaluation. First, the evaluation process was designed which required a elaborate set up since a lot factors are able to vary in game sessions. Thereby, the IEG was developed. Researching, designing, balancing, playtesting and adjusting the IEG was a time consuming process. It is therefore that the emphasis on the importance of the development of tests in the spiral method is evaluated positive.

Phase III – Conclusions
In the final phase the conclusions were drawn.

Reflecting on the research method it can be concluded that despite the valuable results of the analysis phase refinements were made originating from the experience gained in the design phase. For the set up of a research method for a research with similar characteristics it is therefore recommended to include an extra feedback loop from the design phase to the analysis phase. Apart from this feedback loop the designed research method provided a well structured guideline for this research.

7.2.2 Reflection on evaluation

In this subsection the evaluation is reflected upon. The culture driven game design method was evaluated by means of two case studies and an expert interview. It was concluded that the culture driven game design method was able to adapt the IEG to multiple groups of players with a different culture without playtesting the game with these players. However, due to the restricted generalizability of case studies, further research is needed to evaluate if the method is also applicable to other types of serious games and other types of cultures.

In this reflection a research method is applied which claims that generalizations can be made from single case studies (Kennedy, 1979). Kennedy argued that one is to leave the generalization to 'those individuals who wish to apply the evaluation findings to their own situations' (Kennedy, 1979). To provide the possibility to those individuals, the case study and its context need to be described in detailed characteristics. It is then by the judgement of those individuals whether their situation is sufficiently alike the case study conducted, to generalize the evaluation outcomes.

First the case studies and their context are described in detailed characteristics. By comparing these characteristics with their own situation, practitioners of the culture driven game design method are able to judge whether the evaluation outcomes of this research can be generalized to their situation. Next the expectations are stated whether the generalizability of the evaluation outcomes of the culture driven game design method would be affected when any of these characteristics would change.

The case studies conducted in this research can be described by examining the two main elements of the case studies; the Indian Electricity Game and the players.

- The Indian Electricity Game
  - is analogue,
  - combines role play with board gaming,
  - constitutes multiple conflicting interests,
  - is about a challenge that includes technical complexity.
- All the players
  - are relatively young (< 30 years),
  - graduated at university,
  - graduated for technical or beta degree,
  - knew each other before the sessions commenced,
  - formed a culturally homogeneous group at all four levels as described in the model of (Williamson, 2000) in section 1.2.

It is not expected that a change in the characteristics of the game would change the generalizability of the evaluation outcomes of the culture driven game design method. The method identifies the potential conflicts and uses the game-specific knowledge and creativity of the serious game designer to decide whether and how his game should be adapted to the players' culture. The culture driven game design method is therefore very flexible in coping the with different game characteristics.

This is somewhat different for the player characteristics. It is not expected that the the generalizability of the evaluation outcomes of the culture driven game design method will change when the player characteristics of age, field of education and education level are changed. However expectations differ when the method is applied to a situation in which the players do not know each other before the session commences or when the players have a different cultural background on the lower three levels of the model of Williamson. A change in one of these player characteristics is expected to effect in a change in player interaction. For instance, for a large share of players, playing a game with friends results in different behaviour than playing a game with strangers.

As the culture driven game design method does not account for these player characteristics nor will the output be adapted. It is therefore expected that the culture driven game design method would be evaluated differently when the method is applied in situations in which the players do not know each other or have a different cultural background on the lower three levels of the model of Williamson.

Reflecting on the evaluation, three issues were stated in chapter 6 that limited the conclusions;

- because of the experience the targeted players gained in the playtest session, not all adjustments in the case studies could be evaluated.
- not all culture dimensions could be evaluated because the players that differed maximally from the playtesters only scored different on three of the five culture dimensions.
- because only one game is used in the case studies, the applicability of the method on other games could not be evaluated.

These three issues restricted the generalizability of the conclusions. It is therefore that the case studies and its context are described in detail in this subsection, so that other practitioners of the culture driven game design method can judge themselves whether their case is sufficiently alike the case studies executed, so that the evaluation outcomes can be generalized to their case.

It is expected that the evaluation outcomes of the culture driven game design method can be generalized to cases in which the game or the personal player characteristics are different. The generalizability remains restricted for cases in which the players do not know each other before the session commences or have a different cultural background on the lower three levels of the model of Williamson.

CHAPTER 8 – CONCLUSIONS AND RECOMMENDATIONS

In the previous chapter the results and the process were discussed and reflected upon. With the insight gained in that chapter and the results of preceding chapters, the conclusions are drawn in this final chapter. After the conclusion in section 8.1, the recommendations are stated in section 8.2.

8.1 Conclusions

In the introduction of this report it was stated that serious games are an important tool in creating, explaining, building, deploying and evaluating solutions for complex multi-actor problems. The Indian electricity challenge is such a complex multi-actor problem which forms the content of the Indian Electricity Game. To become a success it is necessary that serious games, like the Indian Electricity Game, are adjusted to the culture of its players. By playtesting with the targeted players, game designers are able to adjust their serious games to the culture of the targeted players. However, due to a lack of time, high costs and the need for a good first impression, playtesting is not always possible. It was concluded that game designers need a serious game design method to support them in adapting their games to the culture of the players.

This problem statement led to the following main research question:

> *What method is able to adapt serious games to the culture of the players without playtesting them with these players?*

To answer the main research question, six research questions were posed. The research questions and their answers are presented here, followed by the answer to the main research question. Together these formed the conclusions of this research.

1. How do existing serious game design methods adapt serious games to the culture of the players? *(methodological)*

In chapter 2 the four serious game design methods shown in Table 20 were analyzed.

Table 20 – Framework of serious game design methods

		PLATFORM DIMENSION	
		Analogue & Digital games	Digital games only
DESIGN APPROACH DIMENSION	Waterfall	*Duke, Geurts* Design Sequence	*Crawford* Game Design Sequence
	Agile	*Kortmann, Harteveld* Triadic Game Design Development Method	*Fullerton* Playcentric Approach

From these analyses, it was concluded that in order to adapt serious games to the players' culture, none of these existing serious game design methods provides an alternative to the known way of playtesting. Two of the four analyzed design methods, the Triadic Game Design development model and the playcentric approach, have a structure that allows playtesting with the targeted players. However, none of these two design methods explicitly state that a playtest session should be organized in order to adapt the game to the culture of the targeted players. It is therefore concluded that none of these existing serious game design methods supports game designers in adapting their serious games to the players' culture.

As a consequence of this conclusion this research proceeded with the design of the culture driven game design method, a serious game design method that is able to adapt serious games to the players' culture without playtesting them with these players.

2. Which existing serious game design method has the best structure that can be used as a starting point for the design of a method that is able to adapt serious games to the culture of the players. *(choice of method)*

In chapter 3 the Triadic Game Design development model was selected to function as the foundation of the culture driven game design method. This method was selected because (1) it is an agile method which is able to cope with the socio-political complexity of complex multi actor problems and (2) it is applicable to both analogue and digital serious games.

3. What are the requirements for a method that is able to adapt serious games to the culture of the players? *(design requirements)*

In chapter 3 the requirements for the culture driven game design method were presented. The requirements, as stated in table 21, followed from the problem statement and an interview with a serious game designer.

Table 21 – Requirements of the culture driven game design method

	REQUIREMENT
A.1	The method must be applicable to all types of serious games.
A.2	The method must be applicable to all types of cultures.
A.3	The method must not include playtesting with the targeted players.
A.4	The method must be able to adapt serious games to the culture of the targeted players.
B.1	The amount of time needed by the serious game designer to apply the method should be minimized.
B.2	The amount of time needed for the client of the serious game designer to provide input should be minimized.
B.3	The costs to apply the method should be minimized.
B.4	It should be possible to apply the method without any knowledge of theory on culture.
C.1	The method should provide an overview of the culture of the players.
C.2	The method should provide an overview of the critical factors.
C.3	The method should provide suggestions how to deal with the identified factors.

With the TGDdm selected as the foundation and the requirements listed, this research proceeded with the design of the culture driven game design method.

4. What method can be developed that is able to adapt serious games to the culture of the players without playtesting them with these players? *(design)*

In chapter 4 the development of the culture driven game design method was described. This method consists of the culture driven game design iteration which is embedded in the iterative TGDdm. The iteration, as depicted in figure 40, consists of three steps. In step 1 the culture difference between the playtesters and the targeted players is assessed using an adapted questionnaire of (Hofstede, 2001). In step 2 the assessed culture difference is translated to a set of potential conflicting game elements. In step 3 the relevance of the conflicting game elements is determined. When the relevant conflicting game elements are mitigated in the proceeding design step, the game is adapted to the culture of the players.

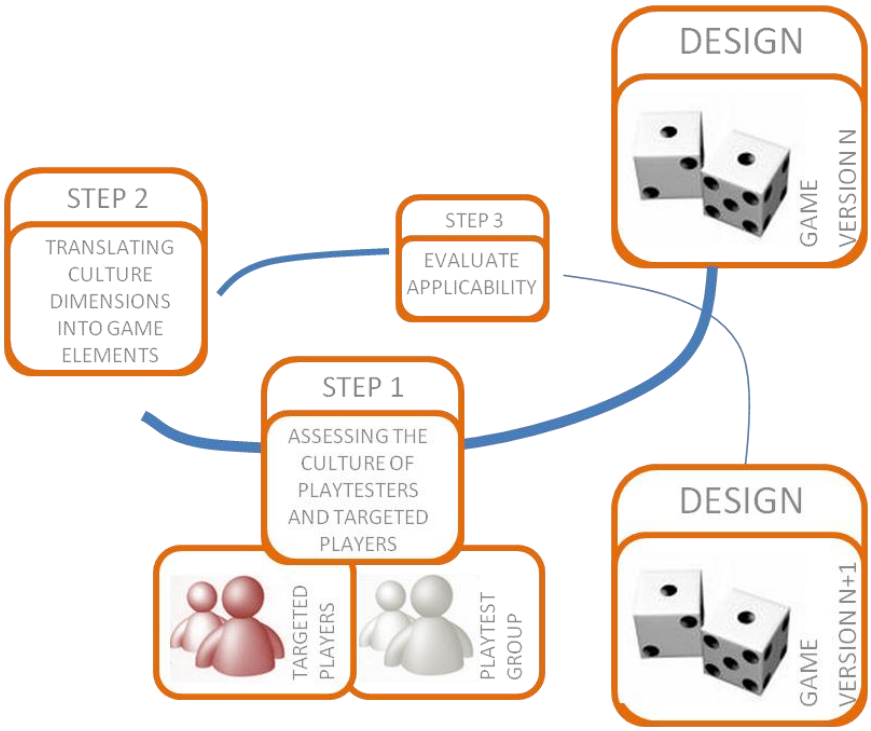

Figure 40 – The culture driven game design iteration

5. Is the designed method able to adapt serious games to the culture of the players without playtesting them with these players? *(evaluation of design)*

In chapter 6 the culture driven game design method was evaluated by means of two case studies and an expert interview. Regarding the functional requirements it was concluded that the culture driven game design method was able to adapt the IEG to multiple groups of players with a different culture without playtesting the game with these players. This was possible while meeting all the constraints and quality requirements that were set. However, further research is needed to evaluate if the method is also applicable to other types of serious games and other types of cultures.

6. Which recommendations can be made for the use of the designed method in combination with other serious game design methods? *(generalization)*

In chapter 7 it was discussed if the culture driven game design iteration can theoretically function independent from the TGDdm. It was concluded that if the culture driven game design iteration is embedded in an agile serious game design method no functionality should theoretically be lost. To evaluate this, the culture driven game design iteration should be tested in further research when embedded in agile serious game design methods other than the TGDdm.

The answers to the research questions allow the main research question to be answered.

> *What method is able to adapt serious games to the culture of the players without playtesting them with these players?*

The culture driven game design method was able to adapt the Indian Electricity Game to multiple groups of players with a different culture without playtesting the game with these players. However, further research is needed to evaluate if the method is also applicable to other types of serious games and other types of cultures.

It is expected that the evaluation outcomes of the culture driven game design method can be generalized to cases in which the game or the personal player characteristics are different. The generalizability remains restricted for cases in which the players do not know each other before the session commences or have a different cultural background on the lower three levels of the model of Williamson.

8.2 Recommendations

Now the conclusions were drawn, this section presents the recommendations. In the first subsection (8.2.1) the recommendations for the further development of the Indian Electricity Game are stated. In the second subsection (8.2.2) the recommendations for the further development of the culture driven game design method are discussed. In the final subsection (8.2.3) the recommendations for further research are stated.

8.2.1 Recommendations for further development Indian Electricity Game

As stated in section 5.2, the IEG developed in this research is the first version of that game. This first version functions as the basis for a larger simulation game that should be created in the future. Since the intention exists to further develop the IEG, the recommendations in this subsection focus on improving and extending the IEG. These recommendations stem from the experience gained in the case studies and elaborate brainstorm sessions conducted with researchers of CSTEP. The recommendations are grouped into two sets. The first set of recommendations can be implemented to form the next version of the IEG. According to the wishes of CSTEP, this game will not exceed 2,5 hours of gameplay. The second set contains recommendations for extending the IEG beyond the second version.

The first set contains recommendations for the proceeding version of the IEG.

- Split the current energy source *solar power* into solar thermal and solar PV. There is a large difference between the two techniques in terms of maturity, efficiency and initial investment costs. Splitting the solar energy source provides a more realistic representation.
- Extend the amount of energy sources available to the players with (a) biomass, (b) geothermal energy and (c) tidal energy. By adding these energy sources the players are able to create an overview of the available methods to generate electricity.
- Include new technologies like coal gasification and carbon capture systems. These technologies are available to India and have a large impact on the future use of the primary energy source in the electricity sector; coal.
- Introduce the option of reducing the demand for electricity by means of electricity efficiency programs. The quickest way to meet the demand for electricity is not to increase supply, but cut demand.

By extending the IEG with the recommendation stated, the gameplay is extended to 2,5 hours. Thereby, implementing these recommendation does not require adjustments to the main structure of the game which makes them easy to implement.

The second set consists of two recommendations that take the IEG a step further. For these recommendations it is expected that the structure of the game needs to be adjusted.

- The first issue that could be included is the difference between state and central level. The Indian electricity sector is a complex institutional environment. Part of this complexity is included in the first version of the IEG. However, to simulate the consequences of the current institutional environment more complexity should be included in the game.
- The second issue that could be included is the limited availability of resources like labour, land and water. Although not the first issues that come up while thinking of India, the scarcity of skilled labour, land and water will become stringent issues. Especially the geographic availability of these resources varies enormously throughout India.

The stated recommendations are two of the many possible extensions that passed during the brainstorm sessions. In evaluating the results of these sessions with the researchers of CSTEP these issues were marked as highly urgent.

8.2.2 Recommendations for further development culture driven game design method

In the previous subsection the recommendations for the further development of the IEG were stated. This subsection proceeds with the recommendations for the further development of the culture driven game design method. These recommendations for further research are aimed at evaluating and directly improving the culture driven game design method.

As stated in the previous chapter, further research is needed to evaluate the culture driven game design method. From the limited amount of case studies conducted in this research it was not possible to conclude if the method is able to adapt all types of serious games to all types of cultures. Two recommendations are provided here for the additional case studies

- The first recommendation is to use and evaluate the culture driven game design *iteration* instead of the *method* in the additional case studies. As discussed in subsection 7.1.2 it is expected that no functionality is lost when the culture driven game design iteration is used independent from the Triadic Game Design development model while the usability of the iteration is improved.
- The second recommendation is to set up the future research using the design science paradigm of (Hevner, et al., 2004). By structuring the research by the design science paradigm, the case studies can be used for the evaluation of the iteration as well as the enrichment of the body of knowledge on the influence of culture in gaming. In this way the translation of the culture dimensions into game elements can be improved simultaneously.

8.2.3 Recommendations for further research

The final set of recommendations has a more explorative character. In the various discussions with researchers from CSTEP and the TU Delft the issue of facilitation style kept showing up. Several authors published on this issue (Heron, 1999; Jarvis, 2002). In *the complete facilitator's handbook* three facilitation styles were identified; the hierarchical mode, co-operative mode and the autonomous mode (Heron, 1999). The author used these modes to describe how effective facilitation can be realized. However, no explicit connection is made with the culture of the players. An interesting topic for further research would be the relation between the choice for a facilitation style and the cultural fit of the game with respect to the players. It is expected that by adapting his style the facilitator has the possibility to increase the comfort the players experience with the game. A facilitator can provide more background information to players with an uncertainty avoiding culture. Or the facilitator can stir up the players with a feminine culture if the game seems to lack vigour. This leads to the final recommendation for further research which should answer the question: Is it possible to design a method that is able to adapt the facilitation style to the culture of the players?

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APPENDIX A – Interview Harteveld

Interviewee: Casper Harteveld
Interviewer: C.J. Meershoek
Date: 28 mei 2010
Location: TU Delft, Delft, the Netherlands

Would you use a method that adapts your game to the players' culture?
Normally I would not use a method that adapts my game to the culture of my players. The serious games I make are in close cooperation with the client which makes it unnecessary to assess their culture since I know them personally. But I can imagine situations building a first version of the game or building a version of a game that is to be used to raise funding for the rest of the project where I would use such a method.

What would be the amount of resources you would spend on applying such a method?
The amount of time and budget spend is of course dependent on the size and importance of the project you are working on. If I would take this game to a large client with a lot of interesting options to extend the cooperation, the amount of resources available is higher than for a smaller project. The best way to put it is the fewer resources needed, the better. And resources goes further than just time and money, also the effort it costs must be as low as possible. I don't want to bother my client with endless questionnaires containing inappropriate questions.

What output do you expect from a method that adapts your game to the players' culture?
As stated before, I would use such a method in a situation in which I don't know my clients that well. It is therefore that my expectations for the output of a method on players' culture start at a very high level. I would like to know how diverse my targeted group of participants is. I want to have an overview of what 'kind' of people I am designing my game for.

When I have that impression of my players I want to know where their culture could collide with my game. Which factors are relevant? What combination of their culture and the design of the game could break the game? This makes it possible for me to prioritize the suggestions done by the method so that when there is limited time or money available, I can easily make the decision what game elements to change and what to keep in place.

Final output I expect of a method that adapts my game to the players' culture are suggestions how to cope with the identified factors. I know this may be very difficult because game design is more art than science and does not come with a finite and known set of game elements but suggestions would be very welcome. In my opinion game designers are able to translate such suggestions to their game without too much hassle.

APPENDIX B – Culture Assessment Questionnaire

Thank you for filling in the Culture Assessment Questionnaire. The results of this questionnaire will be used anonymously in the Msc. Thesis of C.J. Meershoek named 'Adapting serious games to the players' culture'. However for the selection of the players who will play the Indian Electricity Game as the test group your name is used once. You can answer the questions by underlining (CTRL + U) your answer.

Thank you for your cooperation.

Kees

Please look at the clock and write down the exact time you start filling in the questions.

In your ideal job:

Please think of an ideal job, disregarding your present job, if you have one. In choosing an ideal job, how important would it be to you to … (please circle one answer in each line across):

1 = of utmost importance
2 = very important
3 = of moderate importance
4 = of little importance
5 = of very little or no importance

01. have sufficient time for your personal or home life	1	2	3	4	5
02. have a boss (direct superior) you can respect	1	2	3	4	5
03. get recognition for good performance	1	2	3	4	5
04. have security of employment	1	2	3	4	5
05. have pleasant people to work with	1	2	3	4	5
06. do work that is interesting	1	2	3	4	5
07. be consulted by your boss in decisions involving your work	1	2	3	4	5
08. live in a desirable area	1	2	3	4	5
09. have a job respected by your family and friends	1	2	3	4	5
10. have chances for promotion	1	2	3	4	5

In real life:

11. If there is something expensive you really want to buy but you do not have enough money, what do you do?
    1. always save before buying
    2. usually save first
    3. sometimes save, sometimes borrow to buy
    4. usually borrow and pay off later
    5. always buy now, pay off later

12. How often do you feel nervous or tense?
    1. always
    2. usually
    3. sometimes
    4. seldom
    5. never

13. Are you the same person at work (or at school if you're a student) and at home?
    1. quite the same
    2. mostly the same
    3. don't know
    4. mostly different
    5. quite different

14 . All in all, how would you describe your state of health these days?
    1. very good
    2. good
    3. fair
    4. poor
    5. very poor

15. Looking back at situations in which you disagreed with your boss, how often did you contradict your boss?
    1. always
    2. usually
    3. sometimes
    4. seldom
    5. never

Your thoughts about:

To what extent do you agree or disagree with each of the following statements? (please circle one answer in each line across):

1 = strongly agree
2 = agree
3 = undecided
4 = disagree
5 = strongly disagree

16. One can be a good manager without having a precise answer to every question that a subordinate may raise about his or her work	1	2	3	4	5
17. Persistent efforts are the surest way to results	1	2	3	4	5
18. An organization structure in which certain subordinates have two bosses should be avoided at all cost	1	2	3	4	5
19. A company's or organization's rules should not be broken - not even when the employee thinks breaking the rule would be in the organization's best interest	1	2	3	4	5
20. We should honour our heroes from the past	1	2	3	4	5

Time use:

21. How much time did you take to fill in this questionnaire up until this point?
    1. 1 – 5 minutes
    2. 6 – 10 minutes
    3. 11 – 15 minutes
    4. 16 – 25 minutes
    5. 26 minutes or more

Some information about yourself (for statistical purposes):

22. Are you:
    1. male
    2. female

23. How old are you?
    1. Under 20
    2. 20-24
    3. 25-29
    4. 30-34
    5. 35-39
    6. 40-49
    7. 50-59
    8. 60 or over

24. How many years of formal school education (or their equivalent) did you complete (starting with primary school)?
    1. 10 years or less
    2. 11 years
    3. 12 years
    4. 13 years
    5. 14 years
    6. 15 years
    7. 16 years
    8. 17 years
    9. 18 years or over

25. If you have or have had a paid job, what kind of job is it / was it?
    1. No paid job (includes full-time students)
    2. Unskilled or semi-skilled manual worker
    3. Generally trained office worker or secretary
    4. Vocationally trained craftsperson, technician, IT-specialist, nurse, artist or equivalent
    5. Academically trained professional or equivalent (but not a manager of people)
    6. Manager of one or more subordinates (non-managers)
    7. Manager of one or more managers

26. What is your nationality?

    _____

27. What was your nationality at birth (if different)?

    _____

28. Please fill in your name:

    _____

APPENDIX C – Potential conflicts

In this subsection the 16 game dimensions of Wenzler's model are crossed with the Hofstede's five culture dimensions. Each game dimension has 2 extremes. For instance the game dimension 'player roles' runs from real life roles to assumed roles. Each culture dimension also has 2 extremes. For instance the power distance dimension runs from egalitarian to hierarchical cultures. This results in the Cross Dimensional Matrix as displayed in figure C.1.

				CULTURE DIMENSIONS									
				POWER DISTANCE		IDENTITY		GENDER		FEAR OF THE UNKNOWN		GRATIFICATION OF NEEDS	
				Egalitarian	Hierarchical	Collectivistic	Individualistic	Femenine	Masculine	Uncertainty tolerant	Uncertainty avoiding	Short term oriented	Long term oriented
GAME DIMENSIONS	CONTEXT	PROBLEM	Understood										
			Ambiguous										
		OBJECTIVE	Knowledge transfer										
			Knowledge creation										
		MODEL	Qualitative										
			Quantitative										
		STORY	Reality based										
			Metaphor based										
	PARTICIPANTS	TARGET	Single-individual										
			Multiple groups										
		LEVEL	Operational										
			Executive										
		ROLES	Real life										
			Assumed										
		CULTURE	Homogeneous										
			Heterogeneous										
	PROCESS	SEQUENCE	Real time										
			Concentrated										
		INTERACTION	Directive										
			Self organizing										
		STEPS	Sequential										
			Iterative										
		INDICATORS	Qualitative										
			Quantitative										
	ENVIRON-MENT	LOCATION	Single										
			Multiple										
		PLACE	Physical facility										
			Virtual environment										
		MATERIAL	Static										
			Evolving										
		REPRESENTATION	Realistic										
			Symbolic										

Figure C.1 – The Cross Dimensional Matrix

Each cell of the Cross Dimensional Matrix stands for a potential conflict between the players' culture and a game element. So for each cell it was examined if the combination of the specific culture collides with the extreme on the game dimension. This examination resulted in a classification of each cell in three possible states. The classification is as following:

- White – It cannot be deducted from theory neither is there an expectation that a high difference on the culture dimension collides with the extreme on the game dimension.
- Red – It can be deducted from theory that a high difference on the culture dimension collides with the extreme on the game dimension.
- Orange – Using a verifiable assumption it can be deducted from theory that a high difference on the culture dimension collides with the extreme on the game dimension.

As shown in figure C.1, 26 cells are classified as red. One cell is classified as orange and the other 293 cells are classified as white. The cells classified as red or orange are described in this appendix.

Each potential conflict is classified by its culture dimension and game dimension. The description of the potential conflict starts with a relevant explanation of the ways in which the culture dimensions affect the willingness to engage in gaming provided by (G. J. Hofstede, 2008). This theory forms the final stepping stone towards the translation to the game dimension. In the next step the consequences of this willingness to engage in gaming for the specific game dimension are reasoned. Where possible, the description is completed with a suggestion how to mitigate this potential conflict.

CULTURE DIMENSION	GAME DIMENSION
POWER DISTANCE Egalitarian vs. Hierarchical	OBJECTIVE Knowledge transfer vs. Knowledge creation

THEORY AND POTENTIAL CONFLICT

Participants with a hierarchical culture prefer games with a limited freedom of behaviour. When a game has the objective to create knowledge on a certain topic, this involves initiative from the participants. Therefore it can be concluded that games with a knowledge creation objective are likely to trigger cultural resistance from participants with a hierarchical culture.

CULTURE DIMENSION	GAME DIMENSION
POWER DISTANCE Egalitarian vs. Hierarchical	TARGET Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

A game for a single player will not pose any problem for participants with an egalitarian or hierarchical culture since this excludes social interaction. When multiple people participate this changes for participants with a hierarchical culture. For these participants it is impossible to forget the real world hierarchy between people . Simulating a different hierarchy is difficult for both bosses and subordinates . It is should be noted that multiple participants doesn't necessarily need to form a problem, only if incumbent hierarchy isn't respected.

CULTURE DIMENSION	GAME DIMENSION
POWER DISTANCE Egalitarian vs. Hierarchical	LEVEL Operational vs. Executive

THEORY AND POTENTIAL CONFLICT

A game for a single level in an organization will not pose any problem for participants with an egalitarian or hierarchical culture since this excludes in game hierarchy. When different levels of the organization are mixed in the game the situation changes for participants with a hierarchical culture. For these participants it is impossible to forget the real world hierarchy between people . Simulating a different hierarchy is difficult for both bosses and subordinates . It is should be noted that different levels of the organizations in the game doesn't necessarily needs to form a problem, only if incumbent hierarchy isn't respected.

CULTURE DIMENSION	GAME DIMENSION
POWER DISTANCE Egalitarian vs. Hierarchical	ROLES Real life vs. Assumed roles

THEORY AND POTENTIAL CONFLICT

Hofstede states that role playing is not popular for participants with a hierarchical culture. The other combinations do not trigger any cultural resistance.

CULTURE DIMENSION	GAME DIMENSION
POWER DISTANCE Egalitarian vs. Hierarchical	INTERACTION Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

Participants with an egalitarian culture like it to bring some initiative to the game. Games with a directive interaction may be considered boring. For participants from a hierarchical culture the opposite holds. They prefer a more limited freedom of behaviour and may therefore have problems with self organizing interaction in the game.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture think of group membership as a lasting thing which cannot be changed voluntarily. Teaming up with strangers may therefore not come easy. This in contrast with participants with an individualistic culture, for them group membership can be changed at any time.

If the targeted participant is a single individual, the above will obviously form no problem since no groups are involved. This changes when teams or even multiple teams need to be formed. The game designer (and thereby facilitator) need to take the incumbent group memberships into account. The designer should ask himself whether it is necessary for the objectives of the game to break with these incumbent group memberships. If this is not the case the game might be improved by sticking to the incumbent group memberships. Respecting the incumbent group memberships can be realized by sticking to the organizational structure or by leaving the team formation to the players.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
ROLES
Real life vs. Assumed roles

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture think of group membership as a lasting thing which cannot be changed voluntarily . Teaming up with strangers may therefore not come easy. This in contrast with participants with an individualistic culture, for them group membership can be changed at any time.

If the game is played by participants with a collectivistic culture no resistance will be expected when the game uses the real life roles of the participants. When real life roles are played during the game, the incumbent group membership is automatically respected. This is different when the game works according assumed roles. The assumed roles may force the participants to new collaborations and forming of groups which do not respect the incumbent group memberships. At this point cultural resistance may frustrate the game.

If the game is played by participants with an individualistic culture no resistance is expected whether the game uses real life roles or assumed roles.

CULTURE DIMENSION	GAME DIMENSION
IDENTITY	INTERACTION
Individualistic vs. Collectivistic	Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture are likely to stick with group based rules and taboos that belong to their real life group. For participants with an individualistic culture this is less the case.

If the game with directed interaction is played by participants with a collectivistic culture this could trigger cultural resistance. This occurs when the directed interaction collides with the participants' in-group rules and taboos. When the game includes self organizing interaction the participants are able to respect their own rules and taboos so no conflict will rise.

Participants with an individualistic culture are not expected to frustrate the game because of the organization of interaction.

CULTURE DIMENSION	GAME DIMENSION
GENDER	STORY
Feminine vs. Masculine	Reality based vs. Metaphor based

THEORY AND POTENTIAL CONFLICT

Whether the story is reality based or metaphor based does not make a difference for participants with a feminine or masculine culture. One remark that needs to be made is that masculine cultures are intolerant of transgressions and insults towards local heroes or symbols. This could play a role when participant with a masculine culture are asked to play a game with a metaphor based story including such local heroes or symbols.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

The competitiveness of participants with a masculine culture is something which makes them eager to play. This competitiveness can be triggered by including personal or team competition in the game. But wherever there is a winner, there are losers too. Some participants that have a masculine culture may be reluctant to play if they are afraid of losing the game. The presence of too many individuals or teams may contribute to this pre game notion of losing the game.

Participants with a more feminine culture tend to be more compliant and co-operative . This 'sit and talk' culture can result in game that lacks vigour . Providing a single player game to participants with a feminine culture may just be a breeding ground for such a game that lacks vigour since it may lack challenge for the participant.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
INTERACTION
Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

As mentioned before participants who have a masculine culture are generally competitive whereas participants from a feminine culture are compliant and cooperative. In the latter case this may result in a game that lacks vigour . This lack in vigour may be emphasized in games in which the players need to organize the interaction themselves. In that case it is suggested to include a directive interaction pattern guiding the participants with a feminine culture towards more competitive behaviour. For participants with a masculine culture no problems are expected regarding this game dimension.

CULTURE DIMENSION	GAME DIMENSION
GENDER Feminine vs. Masculine	INDICATORS Qualitative vs. Quantitative

THEORY AND POTENTIAL CONFLICT

Quantitative indicators are easier to compare than qualitative indicators. As winning is a major issue for participants with a masculine culture, their preference will probably be at games with quantitative indicators since these identify a clear winner. But wherever there is a winner, there are losers too. Some participants that have a masculine culture may be reluctant to play if they are afraid of losing the game. Quantitative indicators may contribute to this pre game notion of losing the game.

Participants with a more feminine culture tend to be more compliant and co-operative . This 'sit and talk' culture can result in game that lacks vigour. Providing qualitative indicators may contribute to this 'lack of vigour' since it makes it harder to compare results.

CULTURE DIMENSION	GAME DIMENSION
GENDER Feminine vs. Masculine	REPRESENTATION Realistic vs. Symbolic

THEORY AND POTENTIAL CONFLICT

Games may be perceived to ridicule or belittle local heroes or symbols. Masculine cultures are intolerant of transgressions and insults . As this is important to notice when choosing a metaphor for the story of the game, this is also important when choosing the symbolic representation of the game. For feminine cultures the form of representation is not triggering any cultural resistance.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
PROBLEM
Understood vs. Ambiguous

THEORY AND POTENTIAL CONFLICT

An understood problem will not trigger any cultural resistance from participants with an uncertainty tolerant or uncertainty avoiding culture. An ambiguous problem however will be less favourable when playing with participant with an uncertainty avoiding culture. For these participants strange social situations are perceived as threatening. Games can be such situations . Games with an ambiguous problem will only contribute to this. This could be mitigated by giving a thorough introduction stating why the problem is ambiguous and how the game addresses this ambiguity.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
STORY
Reality based vs. metaphor based

THEORY AND POTENTIAL CONFLICT

Reality based stories will not trigger any resistance from participants from both uncertainty tolerant and uncertainty avoiding cultures. Metaphor based stories however might trigger resistance from players with an uncertainty avoiding cultures. Participants with an uncertainty avoiding culture are anxious to make fools of themselves. The metaphor in the story of the game could be ridiculing the players. This should be kept in mind when choosing the metaphor for the story in the game.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

Strange social situations are perceived threatening by participants with an uncertainty avoiding culture. Games can be such situations. The more participants, the higher the chance that the participants are unfamiliar with each other which may lead to these strange social situations.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
ROLES
Real life vs. Assumed roles

THEORY AND POTENTIAL CONFLICT

Participants with an uncertainty avoiding culture are anxious to make fools of themselves, they want to be well prepared. This preparation is easier when real life roles are respected within the game. Uncertainty is increased when participants are forced to play roles which they do not in real life fulfil.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
SEQUENCE
Real time vs. Concentrated

THEORY AND POTENTIAL CONFLICT

The assumption underlying the translation from the uncertainty dimension to the sequence dimension is that a concentrated time sequence results in a higher time pressure for the participants.

If a high time pressured game is played by participants with an uncertainty avoiding culture this may lead to cultural resistance. Participants with an uncertainty avoiding culture like to be good prepared so that they don't make fools of themselves . This becomes harder when less time is available.

It is however, not always the case that a concentrated time sequence results in a higher time pressure for the participants. This assumption should be tested by the serious game designer in step 3 of the culture driven game design iteration before considering adapting the time pressure in the game.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
INTERACTION
Directed vs. Self organizing

THEORY AND POTENTIAL CONFLICT

Strange socials situations are perceived threatening by participants with an uncertainty avoiding culture. Games can be such situations. This can work out two ways considering the interaction dimension.

If the interaction in the game is fully guided by the rules of the game (directive interaction), this can take out the threatening part for participants since it are the rules that prescribe their behaviour. If the interaction in the game is left to the participants (self organizing interaction), this makes the game an even more strange social situation for the participants to be in, since no guidelines exist on how to behave.

But on the other hand, if participants with an uncertainty avoiding culture are faced with a game in which they need to organize interaction themselves, this gives them the opportunity to do it according their own preferences. In this way some of the strange social situations can be avoided.

This may look like that there is no way in which interaction can be organized that suits participants with an uncertainty avoiding culture. This is true and therefore the game designer should be aware of the possible resistance that can come up so that he can take mitigating measures where possible. These mitigating measures also include informing the facilitator on what possible resistance can be expected.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
MATERIAL
Static vs. Evolving

THEORY AND POTENTIAL CONFLICT

Participants with an uncertainty avoiding culture want to be well prepared. It is likely that these participants ask questions about the rules of the game. For these participants transformable material will trigger resistance since it increases the uncertainty in the game.

This may be handled by clearly explaining or stating the rules and procedures that come with the evolving material.

CULTURE DIMENSION
GRATIFICATION OF NEEDS
Short term oriented vs. Long term oriented

GAME DIMENSION
OBJECTIVE
Knowledge transfer vs. Knowledge creation

THEORY AND POTENTIAL CONFLICT

Values associated with the short term oriented culture are respect for tradition, fulfilling social obligations and protecting ones face. For participants with a short term oriented culture gaming collides with the need to demonstrate personal stability and adherence to tradition if the game is perceived as an innovation.

When the objective of the game is knowledge creation the game has a good chance to be interpreted as an innovation which would therefore trigger cultural resistance from participants with a short term oriented culture.

Participants with a long term oriented culture are not expected to raise any cultural resistance as an effect of the character of the objective of the game.

CULTURE DIMENSION
GRATIFICATION OF NEEDS
Short term oriented vs. Long term oriented

GAME DIMENSION
STORY
Reality based vs. Metaphor based

THEORY AND POTENTIAL CONFLICT

Values associated with the short term oriented culture are respect for tradition, fulfilling social obligations and protecting ones face. If the metaphor based story disrespects these values, cultural resistance could be triggered from participants with a short term oriented culture.

APPENDIX D – Chronological description of the Indian Electricity Game

In section 5.3 the Indian Electricity Game is described along the game dimensions of Wenzler's model. This structure of game dimensions was preferred over a chronological description of the game since the same game dimensions were used in the culture driven game design method. This made it easier to follow the application of the culture driven game design method in the case studies. However, forming a complete image of the game from the description along the game dimensions may be difficult, therefore this appendix provides a chronological description.

The Indian Electricity Game follows a briefing-play-debriefing pattern. The gameplay consists of two rounds. This pattern is depicted in figure D.1.

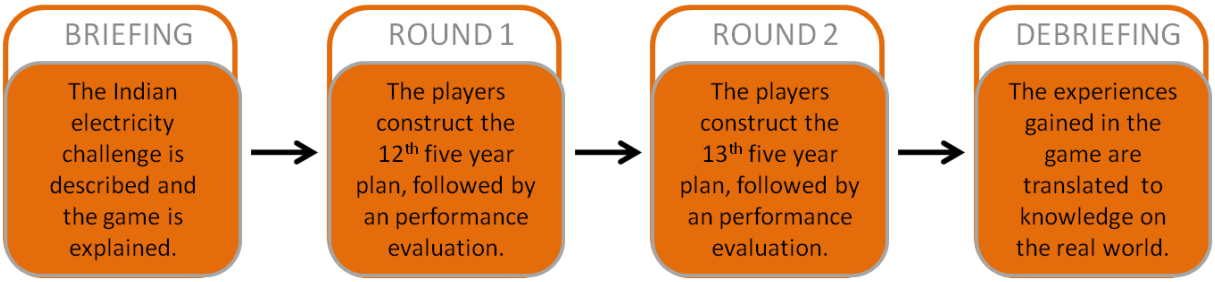

Figure D.1 – IEG: The briefing-play-debiefing pattern

All four phases of the game are described here. The material of the game can be found on the CD attached to the back of this report.

Briefing

The game starts with a powerpoint briefing by the facilitator. In five slides the facilitator provides background information on the Indian electricity challenge and connects it back to the assignment in the game. After the rules and procedures of the game are explained the gameplay can start. Before jumping to this gameplay a description of the briefing structured by the five slides is given here.

1. With the first slide the players are welcomed and grouped in teams of three by the facilitator.
2. The second slide is used to introduce the topic of the game, the Indian Electricity Challenge. By gradually increasing the amount of issues in the introduction of the topic, the complexity of the issue is emphasized. After the slide is filled, the objective of the game is introduced; experiencing the challenges in the planning for electricity generation capacity extension.
3. The third slide introduced the team objective in the game; to construct the 12th and 13th five year plan for the electricity generation capacity extension. It is explained that the players can choose between six energy sources, each offering three different plant types.
4. The fourth slide introduces the personal objectives in the game. This is done by first explaining the three roles in the game, followed by the distribution of the roles over the players. Directly after this an explanation of the information flows during the game is given.
5. The briefing ends with the fifth slide in which the final rules of the game are explained. When the questions of the players are answered, round 1 is started.

Round 1

At the start of round 1 the players receive their individual leaflets. These leaflets contain information regarding the different energy sources and plant types available to construct the 12th plan. The players have 30 minutes to plan for the construction of 86,000 MW equivalent of electricity

generation capacity. The choices made in the plan influence the personal objectives of the players. Each player can ask the facilitator during the game for updates on his personal objectives.

When the 12th plan is finished the evaluation of the first round commences. First the personal objectives are evaluated by means of the quantitative indicators. Second the team objectives are evaluated. It is shown how the designed 12th plan influences the fuel mix for electricity generation. By means of newspaper headlines the qualitative indicators are evaluated. This concerns issues as social costs, security of supply and technical uncertainty. When the performance evaluation is ended the players start with round 2.

Round 2

The second round is similar to the first. The first exception is the presentation of the information. In the first round the players received individual leaflets containing information on the energy sources and plant types regarding different characteristics. Information on the characteristics that are important for the personal objectives are quantified whereas the information on the other characteristics is indicated on a three-point scale. This presentation of the information in the first round emphasized the issues in cooperation between the different institutions. As this point is made, the information is combined to a single clear overview in the second round.

Another exception is that the team needs to plan for 1,19,000 MW equivalent of electricity generation capacity in the second round. The teams needs to plan for this capacity while the options for different energy sources and plant types are restrained by actions in the first round. There is for example a limited amount of fuel available and the team may also have exhausted the options for hydro electric generation in the first round. After the team made their concessions and constructed the 13th plan, the second round is evaluated in a similar way as in the previous round. When the second round is evaluated, the Indian Electricity Game is debriefed.

Debriefing

The final phase of the game is the debriefing. In the debriefing the experience gained in the game is translated to knowledge of the real world. All the issues that were included in this version of the Indian Electricity Game are discussed in an open discussion with the players:

- Construction time and the influence on meeting the electricity demand,
- Investment costs of different generation plants,
- Cost of generation of different generation plants,
- Carbon emissions of different generation plants,
- Availability of different energy sources and the influence on the security of energy supply,
- Technical issues with the different energy sources,
- Social issues related to the utilization of the different energy sources,
- Cooperation between the different central government institutions.

This discussion provides the insight to the players that the issues that appeared in the game are the issues that will appear in the real world planning for electricity generation capacity extension.

APPENDIX E – Step 3 of the Culture Driven Game Design Iteration in Case Study 1

Subsection 6.1.1 describes how in Case Study 1 the Indian Electricity Game was adapted to the players' culture by applying the culture driven game design method. In this appendix part of this process is described. An extensive description is provided on how in step 3 of the culture driven game design iteration the relevance was determined of the potential conflicts identified in step 2. Figure E.1 shows these identified potential conflicts in the output of step 2, the Cross Dimensional Matrix.

				CULTURE DIMENSIONS									
				POWER DISTANCE		IDENTITY		GENDER		FEAR OF THE UNKNOWN		GRATIFICATION OF NEEDS	
				Egalitarian	Hierarchical	Collectivistic	Individualistic	Femenine	Masculine	Uncertainty tolerant	Uncertainty avoiding	Short term oriented	Long term oriented
GAME DIMENSIONS	CONTEXT	PROBLEM	Understood										
			Ambiguous								■		
		OBJECTIVE	Knowledge transfer										
			Knowledge creation		■							■	
		MODEL	Qualitative										
			Quantitative										
		STORY	Reality based										
			Metaphor based						■		■	■	
	PARTICIPANTS	TARGET	Single-individual					■					
			Multiple groups		■	■			■		■		
		LEVEL	Operational		■								
			Executive		■								
		ROLES	Real life										
			Assumed		■	■					■		
		CULTURE	Homogeneous										
			Heterogeneous										
	PROCESS	SEQUENCE	Real time										
			Concentrated								■		
		INTERACTION	Directive	■		■					■		
			Self organizing		■			■			■		
		STEPS	Sequential										
			Iterative										
		INDICATORS	Qualitative					■					
			Quantitative						■				
	ENVIRON-MENT	LOCATION	Single										
			Multiple										
		PLACE	Physical facility										
			Virtual environment										
		MATERIAL	Static										
			Evolving								■		
		REPRESENTATION	Realistic										
			Symbolic						■				

Figure E.1 – CS1: The output of step 1 transferred to the Cross Dimensional Matrix

Figure E.1 shows that the targeted players have a high culture difference on the identity and gender dimensions, a medium culture difference on the 'fear for the unknown' dimension and a low culture difference on the dimensions of power distance and gratification of needs. As a consequence, the Cross Dimensional Matrix indicated 15 potential conflicts.

In the third step of the culture driven game design iteration the relevance of each identified potential conflict is determined. This is done by analyzing whether version X of the IEG utilizes the same game elements as in the description of the potential conflict. If this is the case, it is up to the game designer to remove, adapt or keep the game element.

In the proceeding pages each potential conflict is described. This is done by first providing an explanation of the potential conflict followed by the conclusion for this specific case study.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
MATERIAL
Static vs. Evolving

THEORY AND POTENTIAL CONFLICT

Participants with an uncertainty avoiding culture want to be well prepared. It is likely that these participants ask questions about the rules of the game. For these participants transformable material will trigger resistance since it increases the uncertainty in the game.

This may be handled by clearly explaining or stating the rules and procedures that come with the evolving material.

CONCLUSION

As explained in section 5.3.4 the material in the Indian Electricity Game is slightly evolving. However the set up of the material stays the same which classifies the material as relatively static.

Conclusion: Because the Indian Electricity Game consists of relatively static material, no potential conflict was expected.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture think of group membership as a lasting thing which cannot be changed voluntarily. Teaming up with strangers may therefore not come easy. This in contrast with participants with an individualistic culture, for them group membership can be changed at any time.

If the targeted participant is a single individual, the above will obviously form no problem since no groups are involved. This changes when teams or even multiple teams need to be formed. The game designer (and thereby facilitator) need to take the incumbent group memberships into account. The designer should ask himself whether it is necessary for the objectives of the game to break with these incumbent group memberships. If this is not the case the game might be improved by sticking to the incumbent group memberships. Respecting the incumbent group memberships can be realized by sticking to the organizational structure or by leaving the team formation to the players.

CONCLUSION

During Case Study 1, two sessions of the Indian Electricity Game were played at the same time. As every session requires three employees, the parallel sessions implicate that two teams needed to be composed out of a group of six targeted players. As the targeted players, the CSTEP employees working in the field of energy, have a more collectivistic culture than the playtesters it is recommended by the culture driven game design iteration to respect the incumbent group memberships. However, the targeted players work at the same department, in similar ranks within the organization. This raises the expectation that the incumbent group membership is automatically respected since all six players belong to the same group. But since group membership cannot completely be derived from the organizational structure, and the fact that it would not harm the game play, the choice is made to leave the team composition to the players.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game the players choose their own teams.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
ROLES
Real life vs. Assumed roles

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture think of group membership as a lasting thing which cannot be changed voluntarily . Teaming up with strangers may therefore not come easy. This in contrast with participants with an individualistic culture, for them group membership can be changed at any time.

If the game is played by participants with a collectivistic culture no resistance will be expected when the game uses the real life roles of the participants. When real life roles are played during the game, the incumbent group membership is automatically respected. This is different when the game works according assumed roles. The assumed roles may force the participants to new collaborations and forming of groups which do not respect the incumbent group memberships. At this point cultural resistance may frustrate the game.

If the game is played by participants with an individualistic culture no resistance is expected whether the game uses real life roles or assumed roles.

CONCLUSION

The players of the Indian Electricity Game play according the assumed roles of a representative of the planning commission, MNRE or CEA. However, as discussed with the previous potential conflict, it is expected that the incumbent group membership is automatically respected since all six players belong to the same group. Thereby the players are given the opportunity to compose their own teams. It is therefore not expected that the assumed roles used in the game force the players to new collaborations or the formation of groups which do not respect the incumbent group memberships.

Conclusion: No further adjustment of the game needed.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
INTERACTION
Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture are likely to stick with group based rules and taboos that belong to their real life group. For participants with an individualistic culture this is less the case.

If the game with directed interaction is played by participants with a collectivistic culture this could trigger cultural resistance. This occurs when the directed interaction collides with the participants' in-group rules and taboos. When the game includes self organizing interaction the participants are able to respect their own rules and taboos so no conflict will rise.

Participants with an individualistic culture are not expected to frustrate the game because of the organization of interaction.

CONCLUSION

As described in section 5.3.3 the players have a large degree of freedom in organizing the interaction in the Indian Electricity Game. Since the culture of the targeted participants is more collectivistic than the culture of the test players no conflict is expected.

Conclusion: Because of the large degree of freedom in organizing the interaction, no potential conflict was expected.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
STORY
Reality based vs. Metaphor based

THEORY AND POTENTIAL CONFLICT

Whether the story is reality based or metaphor based does not make a difference for participants with a feminine or masculine culture. One remark that needs to be made is that masculine cultures are intolerant of transgressions and insults towards local heroes or symbols. This could play a role when participant with a masculine culture are asked to play a game with a metaphor based story including such local heroes or symbols.

CONCLUSION

The Indian Electricity Game has a reality based storyline therefore no conflict was expected.

Conclusion: Because the Indian Electricity Game has a reality based story, no potential conflict was expected.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

The competitiveness of participants with a masculine culture is something which makes them eager to play. This competitiveness can be triggered by including personal or team competition in the game. But wherever there is a winner, there are losers too. Some participants that have a masculine culture may be reluctant to play if they are afraid of losing the game. The presence of too many individuals or teams may contribute to this pre game notion of losing the game.

Participants with a more feminine culture tend to be more compliant and co-operative . This 'sit and talk' culture can result in game that lacks vigour . Providing a single player game to participants with a feminine culture may just be a breeding ground for such a game that lacks vigour since it may lack challenge for the participant.

CONCLUSION

Since the targeted players of the game have a more masculine culture than the test players, they may be afraid of losing the game. In the introduction of the game the players are notified of the team objective and their personal objectives. Together with the parallel session that is played in the same room this may contribute to the pre game notion of losing the game. But, the competition between the players in a session is needed for the game dynamics. However, the competition between the different teams in the parallel sessions serves no function. The choice is made to remove or reduce this competition between the teams. Since playing the two sessions apart from each other was no option the competition between the teams is reduced by specifically stating in the introduction that the results of the two parallel sessions will not be compared in any way.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game it is specifically stated in the introduction that the two parallel sessions will not be compared in any way.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
INTERACTION
Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

As mentioned before participants who have a masculine culture are generally competitive whereas participants from a feminine culture are compliant and cooperative. In the latter case this may result in a game that lacks vigour. This lack in vigour may be emphasized in games in which the players need to organize the interaction themselves. In that case it is suggested to include a directive interaction pattern guiding the participants with a feminine culture towards more competitive behaviour. For participants with a masculine culture no problems are expected regarding this game dimension.

CONCLUSION

As described in section 5.3.3 the players have a large degree of freedom in organizing the interaction in the Indian Electricity Game. Since the culture of the targeted participants is more masculine than the culture of the test players no conflict is expected.

Conclusion: Because of the large degree of freedom in organizing the interaction, no potential conflict was expected.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
INDICATORS
Qualitative vs. Quantitative

THEORY AND POTENTIAL CONFLICT

Quantitative indicators are easier to compare than qualitative indicators. As winning is a major issue for participants with a masculine culture, their preference will probably be at games with quantitative indicators since these identify a clear winner. But wherever there is a winner, there are losers too. Some participants that have a masculine culture may be reluctant to play if they are afraid of losing the game. Quantitative indicators may contribute to this pre game notion of losing the game.

Participants with a more feminine culture tend to be more compliant and co-operative . This 'sit and talk' culture can result in game that lacks vigour. Providing qualitative indicators may contribute to this 'lack of vigour' since it makes it harder to compare results.

CONCLUSION

Since the targeted players of the game have a more masculine culture than the test players, they may be afraid of losing the game when there is a large emphasis on the score on quantitative indicators. However, the Indian Electricity Game uses both quantitative and qualitative indicators which reduces this emphasis on the score on quantitative indicators.

Conclusion: As the Indian Electricity Game makes use of both quantitative and qualitative indicators no potential conflict is expected with the targeted players who have a more masculine culture.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
REPRESENTATION
Realistic vs. Symbolic

THEORY AND POTENTIAL CONFLICT

Games may be perceived to ridicule or belittle local heroes or symbols. Masculine cultures are intolerant of transgressions and insults . As this is important to notice when choosing a metaphor for the story of the game, this is also important when choosing the symbolic representation of the game. For feminine cultures the form of representation is not triggering any cultural resistance.

CONCLUSION

The culture of the targeted players is more masculine than the culture of the play testers which may result in a potential conflict when the representation of the game is symbolic. The material used in the Indian Electricity Game is a symbolic representation of the planning process. Because the complexity of this extensive planning process is reduced to a task of 30 minutes this may be ridiculing the planning process. However, the planning process is not the real life task or job of the targeted players. This raises the expectation that the symbolic representation of the planning process does not lead to a potential conflict.

Conclusion: The symbolic representation of planning process in the Indian Electricity does not lead to a potential conflict since the real life role of the players is not affiliated with the symbolized planning process.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
PROBLEM
Understood vs. Ambiguous

THEORY AND POTENTIAL CONFLICT

An understood problem will not trigger any cultural resistance from participants with an uncertainty tolerant or uncertainty avoiding culture. An ambiguous problem however will be less favourable when playing with participant with an uncertainty avoiding culture. For these participants strange social situations are perceived as threatening. Games can be such situations . Games with an ambiguous problem will only contribute to this. This could be mitigated by giving a thorough introduction stating why the problem is ambiguous and how the game addresses this ambiguity.

CONCLUSION

As the targeted players of the game are moderately more uncertainty avoiding than the play testers, an ambiguous problem could form a potential conflict. The choice is made to introduce the topic of the game, the Indian challenge to meet the increasing electricity demand, more extensively. In this new introduction insight is given in the complexity of the challenge. Next to that the choices that may call for questions are explained on beforehand. This should take away most of the ambiguity of the problem.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game the introduction of the challenge India faces in meeting the increasing electricity demand is explained more extensively. Next to that the extension of the introduction of the electricity challenge, the choice for the six energy sources is explained.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
STORY
Reality based vs. metaphor based

THEORY AND POTENTIAL CONFLICT

Reality based stories will not trigger any resistance from participants from both uncertainty tolerant and uncertainty avoiding cultures. Metaphor based stories however might trigger resistance from players with an uncertainty avoiding cultures. Participants with an uncertainty avoiding culture are anxious to make fools of themselves. The metaphor in the story of the game could be ridiculing the players. This should be kept in mind when choosing the metaphor for the story in the game.

CONCLUSION

As the targeted players of the game are moderately more uncertainty avoiding than the play testers, a metaphor based storyline could lead to a potential conflict. However, the Indian Electricity game has a reality based storyline there is no metaphor that could ridicule the players.

Conclusion: Because the Indian Electricity Game has a reality based story, no potential conflict was expected.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

Strange social situations are perceived threatening by participants with an uncertainty avoiding culture. Games can be such situations. The more participants, the higher the chance that the participants are unfamiliar with each other which may lead to these strange social situations.

CONCLUSION

As the targeted players of the game are moderately more uncertainty avoiding than the play testers, a larger amount of players could lead to a potential conflict. However, the Indian Electricity Game is played with only three participants per team. Thereby, all the participants are colleagues from each other which decreases the chance that unfamiliarity leads to strange social situations.

Conclusion: Because the Indian Electricity Game is played by only three participants which are all colleagues from each other, no potential conflict was expected.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
ROLES
Real life vs. Assumed roles

THEORY AND POTENTIAL CONFLICT

Participants with an uncertainty avoiding culture are anxious to make fools of themselves, they want to be well prepared. This preparation is easier when real life roles are respected within the game. Uncertainty is increased when participants are forced to play roles which they do not in real life fulfil.

CONCLUSION

As explained in section 5.3.1 the available time for the Indian Electricity Game is two hours. The two hours are used for the introduction, play and debriefing of the game. The only preparation that is available for the players consists of reading the role description given in the game. However, because the roles are based on real life government institutes it is well possible that the players have more knowledge on these institutes than available in the role description. They could utilize this knowledge when they would play the role for which this knowledge is relevant. Therefore the choice is made to let the players choose their own role within the team.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game the players get to choose their own role.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
SEQUENCE
Real time vs. Concentrated

THEORY AND POTENTIAL CONFLICT

The assumption underlying the translation from the uncertainty dimension to the sequence dimension is that a concentrated time sequence results in a higher time pressure for the participants.

If a high time pressured game is played by participants with an uncertainty avoiding culture this may lead to cultural resistance. Participants with an uncertainty avoiding culture like to be good prepared so that they don't make fools of themselves . This becomes harder when less time is available.

It is however, not always the case that a concentrated time sequence results in a higher time pressure for the participants. This assumption should be tested by the serious game designer in step 3 of the culture driven game design iteration before considering adapting the time pressure in the game.

CONCLUSION

Since the players have a moderately more uncertainty avoiding culture than the test players, a game played under high time pressure may lead to a potential conflict. The Indian Electricity Game is such a game. However, this time pressure serves a purpose. As the core of the game is a planning assignment with a simplified quantitative model as the basis, it is possible for the players to calculate the optimal configuration if given enough time and calculation power. However, such a calculation would drive out the discussion over energy sources necessary to convey the knowledge in the game. By putting the players under high time pressure they shift their way of working from calculating to negotiating.

However, as mentioned, this time pressure may lead to a potential conflict. To avoid this conflict the choice is made to lower the time pressure by adding 5 minutes per round to the available time. In order to ensure that the game remains a negotiation game instead of a calculation race the introduction is adjusted. In the introduction it is made explicit that the players should not waste their time on discussing single MW's but instead focus on the choices that fill in the larger numbers.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game the time available for the players is extended with 5 minutes to 25 minutes per round. Thereby it is explicitly stated in the introduction that the players should not waste their time on discussing single MW's but instead focus on the choices that fill in the larger numbers.

CULTURE DIMENSION
FEAR OF THE UNKNOWN
Uncertainty tolerant vs. Uncertainty avoiding

GAME DIMENSION
INTERACTION
Directed vs. Self organizing

THEORY AND POTENTIAL CONFLICT

Strange socials situations are perceived threatening by participants with an uncertainty avoiding culture. Games can be such situations. This can work out two ways considering the interaction dimension.

If the interaction in the game is fully guided by the rules of the game (directive interaction), this can take out the threatening part for participants since it are the rules that prescribe their behaviour. If the interaction in the game is left to the participants (self organizing interaction), this makes the game an even more strange social situation for the participants to be in, since no guidelines exist on how to behave.

But on the other hand, if participants with an uncertainty avoiding culture are faced with a game in which they need to organize interaction themselves, this gives them the opportunity to do it according their own preferences. In this way some of the strange social situations can be avoided.

This may look like that there is no way in which interaction can be organized that suits participants with an uncertainty avoiding culture. This is true and therefore the game designer should be aware of the possible resistance that can come up so that he can take mitigating measures where possible. These mitigating measures also include informing the facilitator on what possible resistance can be expected.

CONCLUSION

As discussed in section 5.3.3, the players of the Indian Electricity Game have a large degree of freedom in organizing the interaction. There is no format that the players have to follow when composing the five year plans, although hints are dropped shaping the interaction. This provides them with the opportunity to organize the interaction according to their own preferences. However, it may also be the case that the absence of guidelines for behaviour makes the game a strange social situation. In these situations the facilitator should emphasize the hints available in the game material in order to provide some guidelines to the players.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game the facilitator is instructed to monitor the organization of interaction between the players. If the players behave in a way that indicates they need more guidance, the facilitator is instructed to emphasize the hints available in the game material.

APPENDIX F – Step 3 of the Culture Driven Game Design Iteration in Case Study 2

Subsection 6.2.1 describes how in Case Study 2 the Indian Electricity Game was adapted to the players' culture by applying the culture driven game design method. In this appendix part of this process is described. An extensive description is provided on how in step 3 of the culture driven game design iteration the relevance was determined of the potential conflicts identified in step 2. Figure F.1 shows these identified potential conflicts in the output of step 2, the Cross Dimensional Matrix.

				CULTURE DIMENSIONS									
				POWER DISTANCE		IDENTITY		GENDER		FEAR OF THE UNKNOWN		GRATIFICATION OF NEEDS	
				Egalitarian	Hierarchical	Collectivistic	Individualistic	Femenine	Masculine	Uncertainty tolerant	Uncertainty avoiding	Short term oriented	Long term oriented
GAME DIMENSIONS	CONTEXT	PROBLEM	Understood										
			Ambiguous								■		
		OBJECTIVE	Knowledge transfer										
			Knowledge creation		■							■	
		MODEL	Qualitative										
			Quantitative										
		STORY	Reality based										
			Metaphor based						■		■	■	
	PARTICIPANTS	TARGET	Single-individual					■					
			Multiple groups		■	■			■		■		
		LEVEL	Operational		■								
			Executive		■								
		ROLES	Real life										
			Assumed		■	■					■		
		CULTURE	Homogeneous										
			Heterogeneous										
	PROCESS	SEQUENCE	Real time										
			Concentrated										
		INTERACTION	Directive	■		■					■		
			Self organizing		■			■			■		
		STEPS	Sequential										
			Iterative										
		INDICATORS	Qualitative					■					
			Quantitative						■				
	ENVIRON-MENT	LOCATION	Single										
			Multiple										
		PLACE	Physical facility										
			Virtual environment										
		MATERIAL	Static										
			Evolving								■		
		REPRESENTATION	Realistic										
			Symbolic						■				

Figure F.1 – CS2: The output of step 1 transferred to the Cross Dimensional Matrix

As shown in figure F.1, the three culture dimensions with a difference level classified as low are coloured green. The difference on the culture dimensions *identity* and *gender* were classified as medium. Since the targeted players have a moderately more collectivistic and masculine culture, the respective columns are coloured yellow. The Cross Dimensional Matrix indicates 7 potential conflicts.

In the third step of the culture driven game design iteration the relevance of each identified potential conflict is determined. This is done by analyzing whether version X of the IEG utilizes the same game elements as in the description of the potential conflict. If this is the case, it is up to the game designer to remove, adapt or keep the game element.

In the proceeding pages each potential conflict is described. This is done by first providing an explanation of the potential conflict followed by the conclusion for this specific case study.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
REPRESENTATION
Realistic vs. Symbolic

THEORY AND POTENTIAL CONFLICT

Games may be perceived to ridicule or belittle local heroes or symbols. Masculine cultures are intolerant of transgressions and insults . As this is important to notice when choosing a metaphor for the story of the game, this is also important when choosing the symbolic representation of the game. For feminine cultures the form of representation is not triggering any cultural resistance.

CONCLUSION

The culture of the targeted players is more masculine than the culture of the play testers which may result in a potential conflict when the representation of the game is symbolic. The material used in the Indian Electricity Game is a symbolic representation of the planning process. Because the complexity of this extensive planning process is reduced to a task of 30 minutes this may be ridiculing the planning process. However, the planning process is not the real life task or job of the targeted players. This raises the expectation that the symbolic representation of the planning process does not lead to a potential conflict.

Conclusion: The symbolic representation of planning process in the Indian Electricity does not lead to a potential conflict since the real life role of the players is not affiliated with the symbolized planning process.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture think of group membership as a lasting thing which cannot be changed voluntarily. Teaming up with strangers may therefore not come easy. This in contrast with participants with an individualistic culture, for them group membership can be changed at any time.

If the targeted participant is a single individual, the above will obviously form no problem since no groups are involved. This changes when teams or even multiple teams need to be formed. The game designer (and thereby facilitator) need to take the incumbent group memberships into account. The designer should ask himself whether it is necessary for the objectives of the game to break with these incumbent group memberships. If this is not the case the game might be improved by sticking to the incumbent group memberships. Respecting the incumbent group memberships can be realized by sticking to the organizational structure or by leaving the team formation to the players.

CONCLUSION

The targeted players have a moderately more collectivistic culture than the test players. During Case Study 2, two sessions of the Indian Electricity Game are played at the same time. As every session requires three players, the parallel sessions implicate that two teams needed to be composed out of a group of six targeted players. As the targeted players, the TU Delft students, have a moderately more collectivistic culture than the play testers it is recommended by the culture driven game design iteration to respect the incumbent group memberships. However, the targeted players all know each other from their study at the same faculty. This raises the expectation that the incumbent group membership is automatically respected since all six players belong to the same group. But since group membership cannot completely be derived from the organizational structure, and the fact that it would not harm the game play, the choice is made to leave the team composition to the players.

Conclusion: Adjustment of version X: In version C of the Indian Electricity Game the players choose their own teams.

CULTURE DIMENSION	GAME DIMENSION
IDENTITY	ROLES
Individualistic vs. Collectivistic	Real life vs. Assumed roles

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture think of group membership as a lasting thing which cannot be changed voluntarily . Teaming up with strangers may therefore not come easy. This in contrast with participants with an individualistic culture, for them group membership can be changed at any time.

If the game is played by participants with a collectivistic culture no resistance will be expected when the game uses the real life roles of the participants. When real life roles are played during the game, the incumbent group membership is automatically respected. This is different when the game works according assumed roles. The assumed roles may force the participants to new collaborations and forming of groups which do not respect the incumbent group memberships. At this point cultural resistance may frustrate the game.

If the game is played by participants with an individualistic culture no resistance is expected whether the game uses real life roles or assumed roles.

CONCLUSION

The players of the Indian Electricity Game play according the assumed roles of a representative of the planning commission, MNRE or CEA. However, as discussed with the previous potential conflict, it is expected that the incumbent group membership is automatically respected since all six players belong to the same group. Thereby the players are given the opportunity to compose their own teams. It is therefore not expected that the assumed roles used in the game force the players to new collaborations or the formation of groups which do not respect the incumbent group memberships.

Conclusion: No further adjustment of the game needed.

CULTURE DIMENSION
IDENTITY
Individualistic vs. Collectivistic

GAME DIMENSION
INTERACTION
Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

Participants with a collectivistic culture are likely to stick with group based rules and taboos that belong to their real life group. For participants with an individualistic culture this is less the case.

If the game with directed interaction is played by participants with a collectivistic culture this could trigger cultural resistance. This occurs when the directed interaction collides with the participants' in-group rules and taboos. When the game includes self organizing interaction the participants are able to respect their own rules and taboos so no conflict will rise.

Participants with an individualistic culture are not expected to frustrate the game because of the organization of interaction.

CONCLUSION

As described in section 5.3.3 the players have a large degree of freedom in organizing the interaction in the Indian Electricity Game. Since the culture of the targeted participants is more collectivistic than the culture of the test players no conflict is expected.

Conclusion: Because of the large degree of freedom in organizing the interaction, no potential conflict was expected.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
STORY
Reality based vs. Metaphor based

THEORY AND POTENTIAL CONFLICT

Whether the story is reality based or metaphor based does not make a difference for participants with a feminine or masculine culture. One remark that needs to be made is that masculine cultures are intolerant of transgressions and insults towards local heroes or symbols. This could play a role when participant with a masculine culture are asked to play a game with a metaphor based story including such local heroes or symbols.

CONCLUSION

The Indian Electricity Game has a reality based storyline therefore no conflict was expected.

Conclusion: Because the Indian Electricity Game has a reality based story, no potential conflict was expected.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
TARGET
Single individual vs. Multiple groups

THEORY AND POTENTIAL CONFLICT

The competitiveness of participants with a masculine culture is something which makes them eager to play. This competitiveness can be triggered by including personal or team competition in the game. But wherever there is a winner, there are losers too. Some participants that have a masculine culture may be reluctant to play if they are afraid of losing the game. The presence of too many individuals or teams may contribute to this pre game notion of losing the game.

Participants with a more feminine culture tend to be more compliant and co-operative . This 'sit and talk' culture can result in game that lacks vigour . Providing a single player game to participants with a feminine culture may just be a breeding ground for such a game that lacks vigour since it may lack challenge for the participant.

CONCLUSION

Since the targeted players of the game have a moderately more masculine culture than the test players, they might be afraid of losing the game. In the introduction of the game the players are notified of the team objective and their personal objectives. Together with the parallel session that is played in the same room this may contribute to the pre game notion of losing the game. However, no comparisons are made between the two teams in the parallel sessions. This in combination with the only moderately more masculine culture of the targeted players led to the choice not to change the game.

Conclusion: As the targeted players of the game only have a moderately more masculine culture than the test players and competition between the players is a necessary element in the game this is not changed. Just as in version X, in the case questions are asked, the facilitator can explain to the players that there is not competition between the teams since the teams results will not be compared.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
INTERACTION
Directive vs. Self organizing

THEORY AND POTENTIAL CONFLICT

As mentioned before participants who have a masculine culture are generally competitive whereas participants from a feminine culture are compliant and cooperative. In the latter case this may result in a game that lacks vigour. This lack in vigour may be emphasized in games in which the players need to organize the interaction themselves. In that case it is suggested to include a directive interaction pattern guiding the participants with a feminine culture towards more competitive behaviour. For participants with a masculine culture no problems are expected regarding this game dimension.

CONCLUSION

As described in section 5.3.3 the players have a large degree of freedom in organizing the interaction in the Indian Electricity Game. Since the culture of the targeted participants is more masculine than the culture of the test players no conflict is expected.

Conclusion: Because of the large degree of freedom in organizing the interaction, no potential conflict was expected.

CULTURE DIMENSION
GENDER
Feminine vs. Masculine

GAME DIMENSION
INDICATORS
Qualitative vs. Quantitative

THEORY AND POTENTIAL CONFLICT

Quantitative indicators are easier to compare than qualitative indicators. As winning is a major issue for participants with a masculine culture, their preference will probably be at games with quantitative indicators since these identify a clear winner. But wherever there is a winner, there are losers too. Some participants that have a masculine culture may be reluctant to play if they are afraid of losing the game. Quantitative indicators may contribute to this pre game notion of losing the game.

Participants with a more feminine culture tend to be more compliant and co-operative . This 'sit and talk' culture can result in game that lacks vigour. Providing qualitative indicators may contribute to this 'lack of vigour' since it makes it harder to compare results.

CONCLUSION

Since the targeted players of the game have a moderately more masculine culture than the test players, they may be afraid of losing the game when there is a large emphasis on the score on quantitative indicators. However, the Indian Electricity Game uses both quantitative and qualitative indicators which reduces this emphasis on the score on quantitative indicators.

Conclusion: As the Indian Electricity Game makes use of both quantitative and qualitative indicators no potential conflict is expected with the targeted players who have a more masculine culture.