Bonds & Bridges
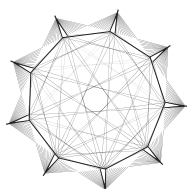
*Facing the Challenges of the Globalizing World
with the Use of Simulation and Gaming*

ISAGA 2011
Bonds & Bridges

CONTENTS

REFLECTION ON A STRUCTURED GAME DESIGN APPROACH FOR A MARKET MODEL DESIGN

Rutger Deenen
Accenture
rutger.deenen@accenture.com

Dr Ivo Wenzler
Faculty of Technology
ivo.wenzler@accenture.com

Sjoerd Helmer
Policy and Management at the Delft University of Technology
sjoerd.helmer@gmail.com

ABSTRACT

One of the main things required to accelerate the development of the electric vehicles market is the new model of how this market should be structured and regulated. Although a preferred (basic) market model has been developed, it proved difficult to develop it further in more detail. In an effort to help further development of the new market model, we have designed the simulation game E-CITY 2020, a custom built market model simulation game of a future preferred market model for the Dutch charging infrastructure for electric transport. The main purpose of the game is to involve (potential) stakeholders in the charging infrastructure part of the market and create insights into the dynamics within the preferred market model. This paper describes the game, highlights the possible contribution of simulation games to a market model design, and presents some challenges when designing a game about highly uncertain systems.

1. INTRODUCTION

The charging of electric vehicles forms a new market, which is emerging partially from existing energy markets. The emergence of such a new

market requires a definition of a market model and description of different market roles (e.g. charge spot owner, charge spot operator) in terms of their responsibilities and the interactions between them (the processes they engage in). A preferred market model has been developed, however, the non-existence of the market (of which the dynamics is difficult to imagine, let alone understand) makes it difficult to develop further such a complex market model. Simulation games, in their various forms (from policy simulations to day-in-life training simulations) are a proven method to help dealing with such complexities. Therefore we designed a simulation game in which we can involve (potential) stakeholders in charging infrastructure and create insights into the dynamics of the preferred market model. This paper describes the E-CITY 2020 simulation game that has been developed not only to create those insights, but to examine the contribution of simulation games to market model design for Dutch energy related markets. This game simulates a market model for the charging infrastructure in a fictive city in 2020. Since simulation games have rarely been applied on the new market model design, we also reflect upon the design process.

2. THE CONCEPTUAL MODEL OF E-CITY 2020

The design of E-CITY 2020 is based on the preferred market model as was presented in the report *'Study market model charging infrastructure for electric transportation'* written by Accenture (2010).

The translation of this market model to the game roles is depicted in Figure 1. The market roles are divided into:

■ Active game roles – the charge spot operators (CSOs) and charge service providers, as being the most central roles of the preferred market model;

■ Facilitated game roles – the local government, the grid company, and the energy supplier, all actors whose decisions place constraints on the behavior of the CSOs and providers; and

■ A simulated role by a computer model – Customers.

In addition to different parties operating in the market, the preferred market model comprise of a number of interrelated processes: pre-charge processes, charge-processes (e.g. identification and measuring), and post-charge processes (e.g. billing, paying and settlement). The E-CITY 2020 intervention focuses on the pre-charge processes – all processes around charge spot realization and contracting of access terms.
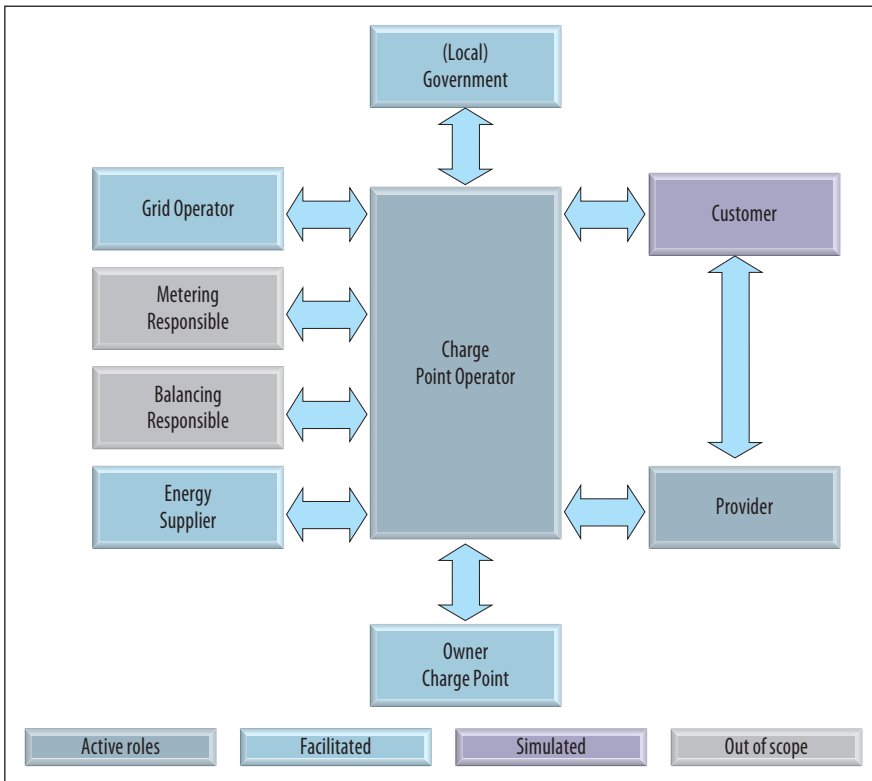
Figure 1. E-CITY 2020 game roles

3. THE E-CITY 2020 GAME

E-CITY 2020 is a custom-built market model simulation game of a future preferred market model for the Dutch charging infrastructure for electric transport. It is a three hour simulation game which combines a role-playing game with a setting that simulates a charging infrastructure market in the six regions of a fictive E-City around 2020.

The main purpose of the game is to involve important stakeholders and create shared insight in: (i) different market roles and their responsibilities; (ii) interactions between different stakeholders within the preferred market model and the processes they engage in; and (iii) requirements for success for implementing the market model.

In this fictitious city, through stimulating government action, increased customer awareness for green transport, and the breakthrough of attractive electric cars, the number of electric cars is expected to surge. In the E-CITY fast and normal charge spots can be installed and there are two groups of customers, private and business (Figure 2).

Figure 2. Map of E-CITY 2020

COURSE OF THE GAME

The E-City 2020 simulation game consists of three main parts: the introduction (Part I), the game itself (Part II) and the evaluation (Part III). Furthermore a questionnaire is used to determine the pre-game and the after-game knowledge, trust levels, and experiences of participants (Figure 3), in part to support addressing the question of simulation games ability to contribute to a market model design.

Part I: In the role of the customer

After a brief presentation on electric transport the participants start getting acquainted with the E-CITY and the simulation game materials. This is done by asking them to think from a customer's perspective and define most common bottlenecks in servicing electric car users. This puts the participants in the right setting for the remainder of the intervention.

Part II: Infrastructure realization

In part two the participants experience the realization of a charging infrastructure from the management point of view of a Charge Spot

Operator or a Service Provider. The purpose is to experience the market dynamics, the roles and their responsibilities, decision options they have, and the character of interactions between different roles. The game simulates the period 2020–2023. Every year (round) is divided into trimesters. The individual goal for every actor is to maximize profit and to gain market share in the market for charging infrastructure in the E-CITY by attracting users of electric vehicles through competitive market offerings of their charging services. The attractiveness criteria are price, coverage, and occupancy rate.
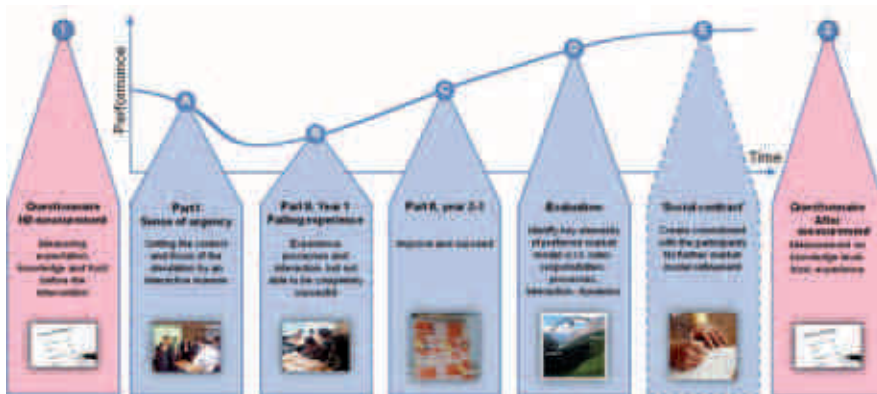
Figure 3. Design and course of E-CITY 2020 intervention

Part III: Evaluation

The evaluation and debriefing are used to let the participants share their experiences, identify learning points and to help them relate these experiences to the current (and future) market model reality. The debriefing was triggered by questions related to the game objectives and its outcomes are to be used in the process of further market model refinement. The expectation is also that the participants (real-life stakeholders) will commit to further market model design process and required cooperation to make it happen.

4. SOME INSIGHTS

A literature review, combined with findings from the E-CITY 2020 intervention, have resulted in four insights on the contribution of simulation games to a market model design. This sections provides a high level overview of these insights.

A. Gaming simulation increases the understanding of the preferred market model

Understanding of the preferred market model is crucial in involving industry stakeholders to help refine the proposed market model further and finally arrive at a required consensus. Gaming simulation is a method that can be useful for visualizing and identifying critical elements of a complex problem and gaining an understanding of the big picture (Wenzler and Chartier, 1999). The experiences and results of the E-CITY 2020 game indicate the ability of a simulation game to help increase the understanding of the preferred market model with both participants and designers.

The level of discussions and issues raised during the debriefing of the game demonstrate that the understanding of the roles, responsibilities and interaction between roles (processes) has been increased. We believe that the fact that during the debriefing the participants were able to share and discuss experiences around the complexity of price setting and risk division in a very specific and concrete way, is an indication that they understood the roles, responsibilities and the constraints of the proposed market model.

Furthermore, the simulation game has supported them in thinking about the issues from different perspectives, such as the customer. In E-CITY 2020 game, the ability to play different roles is imbedded in the game, like in part I of E-CITY 2020, where participants are taking a customer role to experience bottlenecks for the electric car users. During the debriefing some participants mentioned that this brief experience at the beginning of the game had helped them better understand customer needs.

Not only that the existing knowledge is transferred from the market model developers to participants, but by experiencing unexpected dynamics during the game, the new knowledge on the market model is also created, and can be used in further refinement of the market model itself.

B. Designing a simulation game increases the level of understanding of the market model by the designers

Besides the above mentioned learning points for both participants and designers we also observed that the designers increased their own understanding during the design of the game. Druckman and Ebner (2008) have evaluated the effect of designing a game even more positive than participating in a game. By experiments they showed that participants in designing the game were even more motivated and had a better understanding of the concept than those that only participated in the game run (Druckman and Ebner, 2008). Probably the synthesis part, which is intended to define the relationships between different elements of the system, enabled the best learning through the game design process. For design one "*needs to have systemic understanding – seeing the connections*

among roles, goals, resources, constraints and contingencies" (Greenblatt, 1998).

Our observations indicated that the game design process was actually a learning process on the part of designers. Not only that we observed a steep learning curve with the game designers, but also the designers of the market model themselves have indicated there were a lot of learning points regarding the market model they developed. The market model designers indicated that they have "*Explored the boundaries of the market model by thinking about drivers for a game. By not only touching upon the processes and roles, but also upon the customer demand and business models, helped them put the market model in a wider context of challenges and problems*". These relations become clear since the designers were forced to think about motivations and goals and had to link them to other roles, in order to be able to make them specific enough for the game. Understanding of the 'real' incentives for the roles in the market model was needed in order to 'model' these into the game, and to 'simulate' the realistic behavior of the roles played by the participants.

C. Gaming simulation helps creating a shared understanding among the participants of a possible future for the preferred market model

Having a shared understanding of a difficult to imagine (future) market model could help in developing a consensus. The E-CITY 2020 game brings people together to explore an alternative future in a condensed time frame, and through that it helps creation of a shared understanding and a shared formulation of problems and solutions (Wenzler and Chartier, 1999).

There are three types of observations that support this argument. First, questions on the knowledge of market roles show that differences in understanding of the roles beforehand are converging to common ideas about the roles and responsibilities after the game. Secondly, questions of trust in electric transport and the preferred market model were included in the questionnaire. It was found that the gaming intervention has leveled the views on expected differences between interests. The third indication is the fact that we observed people actively sharing and comparing their experiences of the game during the debriefing. Kolb (1984, p. 21) acknowledges this as *"when human beings share an experience, they can share it fully, concretely and abstractly".*

D. People seem to be better motivated to attend a simulation game than a traditional presentation or workshop

It is important in this phase of a market model design to involve stakeholders. To be willing to participate the most important is that parties have a sense of urgency and know that there is something in it for them (Bruijn et al., 2002). Besides a needed sense of urgency we believe that the attractiveness of the intervention also helps bringing people together.

We expected that a 'traditional' workshop or presentation does not sound interesting enough to attract people to attend. A presentation or workshop might be again just one of the many that people are engaged with, whereas a simulation game creates an experiential and experimental learning environment in which people interact within their own possible futures, which is fun to do (Wenzler and Chartier, 1999; Wenzler and Higgins, 2009). A gaming simulation is therefore expected to be better differentiated from other types of workshops or events. In our experience running a simulation game makes it easier to get people involved for the first time.

There were several indications that people are better motivated to attend a simulation game than a presentation. Questions on the attractiveness were included in the questionnaire. 100% of the respondents were expecting both an interesting and informative session. Furthermore, 28% indicated that they would not have reserved three hours time to come to this meeting if they knew that it would be a presentation or workshop on the market model instead of a game. 42% doubted to come to a presentation and took a neutral stance.

All participants thought the simulation game was both fun and informative and 83% of the participants would participate in a following simulation game in their own field of experience. This demonstrates that a simulation game does not only seem to be attractive beforehand, but the participants also experience the intervention as interesting, which increases the chance on a social contract for further participation.

5. REFLECTION

For the design of the E-CITY 2020 simulation we applied the five step design process of Wenzler (1997), a design process we use when developing a game, simulation, policy exercise or any other type of what we generally call a 'simulated reality' (Figure 4).

In this section we provide recommendation for game design by reflecting on the development of the market model game E-CITY 2020 and present some challenges when designing a game about highly uncertain systems.

STEP 1: Development of design specifications

Challenge: Who is the client of a design process of a game about a highly uncertain system like a market model? If we don't know who the client is, we don't know what their stakes are, we don't know the possible dynamics between different parties, and we don't know what they will do with the outcomes of the game. Specifications are dependent on the

expected solution. If we are defining specifications on our own, instead of with the client, we can miss important details and if the client consists of multiple parties, there will be difficulty in getting consensus.

Possible resolution: Because of the multi-actor setting we can create a group where all perspectives are represented and let this group serve as a client. We can take this stakeholder group through the entire specifications phase and define a common direction together with them.

Impact: Such a stakeholder group requires more time and resources and needs to be carefully organized and managed, because we still need to make choices who to listen to.
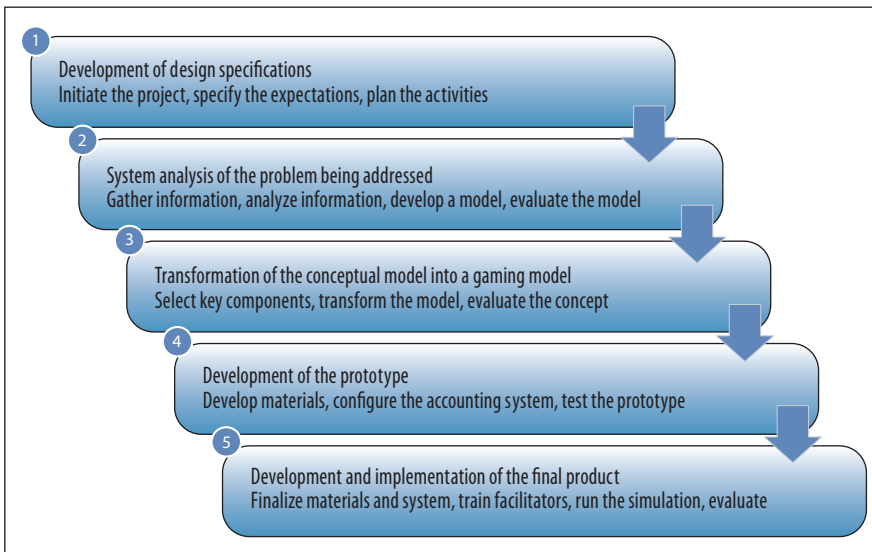

Figure 4. Five step design process of Wenzler (1997)

STEP 2: System analysis of the problem being addressed

Challenge: How to conduct a structured system analysis of a highly uncertain systems like a non-existing market? If we need to build a conceptual model of something that doesn't exist, and no one can describe the expected situation in sufficient detail, we will get multiple perceptions of the future, or even multiple futures that need to be represented in the conceptual model.

Possible resolution: The system analysis should not only be a linear conversion, but we need to take quick iterations between prototyping and testing with the stakeholder group. By building prototypes we are forced to define the model of the future market. Besides that, everybody will need to agree on the basic elements of the market design. We need to make assumptions with stakeholders about the uncertain future, therefore we use the system analysis to build the model of the non existing reality, and let stakeholders challenge that, and improve through multiple iterations.

Impact: Such an iterative approach requires more time and resources, needs to be carefully organized and managed, and will most probably result in multiple conceptual models. This will require a choice to cover all of them or select one.

STEP 3: Transformation of the conceptual model into a gaming model

Challenge: How to develop a game with multiple uncertainties in the conceptual model? If we have a conceptual model and are not sure that this will become reality, how can we make it complete, consistent, acceptable, and playable?

Possible resolution: To cope with the uncertainties in the conceptual model, starting points should be created for scenario based development through quick prototyping of things that cannot be defined. If there are gaps between different models, we can model these models as different options and see how they evolve (scenario's). We can also leave the uncertainties open, and let them evolve by actions of the participants (open ended). An example in the E-CITY game is the step in where players need to develop a contract, instead of prescribing the contract. The content of the contract will be the result of the game.

Impact: Such a prototype approach not only requires more time and resources, it is also more complex because there are more uncertainties in outcomes. Both the dynamics in the game as well as the results from the game will be unpredictable, and therefore need to be managed by proper facilitation of the game.

STEP 4: Development of the prototype

Challenge: How to facilitate a game with multiple degrees of freedom? The facilitator cannot only facilitate the process, but also needs to control the uncertainties and related impact.

Possible resolution: The facilitator needs to get more space from a content perspective, to be able to steer the game. This steering should be performed from a simulated game role. For instance the facilitator taking the role of a legislator. This way the facilitator can intervene, from a position of authority – not authority of the facilitator, but the authority of the role with its specific knowledge and mandate to make decisions.

Impact: Such a facilitator needs to have extensive knowledge about the highly uncertain system and be credible in his actions, because his behavior needs to be seen as representative and valid by the players. The facilitator also needs to be able to deal with unexpected and unpredicted circumstances. He needs to be flexible and should be able to improvise, because he is not only facilitating, but also steering and guarding the game process.

STEP 5: Development and implementation of the final product

Challenge: How to transform the learning from the game into results for the highly uncertain system, like the market model? If the stakeholder group has differing or conflicting stakes in the proposed solution, how will they impact the translation of results into actions?

Possible resolution: We should convince the stakeholder group that the game is a vehicle to translate game results into actions. The process of designing, developing, and implementing the game should therefore be extended with a transformation phase, so the game is just an element in the transformation process. The stakeholder group should make upfront agreements in the specifications phase on the nature and extent of translation activities.

Impact: We need to create upfront commitment in the stakeholder group to accept the results, and to translate results into actions. These actions will be role specific, like legislation, infrastructure agreements etc.

REFERENCES

Accenture (2010) *Study Market Model Charging Infrastructure for Electric Transportation*.

Bruijn J.A., E.F. Heuvelhof ten, and R. Veld in het (2002) *Processmanagement*. Dordrecht: Kluwer Academic Publishers.

Druckman D., Ebner N. (2008) Onstage or behind the scenes? Relative learning benefits of simulation role-play and design. *Simulation Gaming*, Vol. 39, No. 4, pp. 465–497.

Greenblatt C.S. (1998) *Designing games and simulations: An illustrated handbook*. Newbury Park, CA: Sage Publications Inc.

Kolb D.A. (1984) *Experiential learning: experience as the source of learning and development*. Englewood Cliff, NJ: Prentice Hall.

Wenzler I. (1997) *Take five: Gaming/simulation design process. Simulation and gaming for sustainable development*. Riga, Latvia, Environmental Publishers Vide, pp. 251–259.

Wenzler I., D. Chartier (1999) Why Do We Bother with Games and Simulations: An Organizational Learning Perspective. *Simulation & Gaming*, Vol. 30, p. 375.

Wenzler I., Higgins J. (2009) *Gaming the system: Using simulation games for both learning and business effectiveness, in Chief Learning Officer*. Mediatec Publishing Inc.: Chicago.