Simulation Games - A concise introduction to the design process

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Samen spraak spel simulaties

Information on Simulation Games

SIMULATION GAMES - A CONCISE INTRODUCTION TO THE DESIGN PROCESS

Contents

1 Introduction

Simulation Games may rejoice in a growing interest for their application in a variety of areas, such as in education and training but also in consultation and other forms of counseling. Sometimes ready-to-use simulation games are used (the so-called "off-the-shelf games"). These are simulation games that focus on specific themes, such as collaboration, negotiation and leadership styles, which can be used in many situations. In addition, there are simulation games specifically tailored to a specific problem in a specific context or organization. These so-called "tailor-made" simulation games are designed to be used in that specific context; the way the underlying problem or issue is being addressed is specific to this situation[1].

In this report we discuss how these simulation games can be developed. Since the early 70s the necessity of having and using a methodology for developing simulation games has been stressed. In his book *Gaming, the future's language* Duke (1974) moves towards a methodology, which was later further developed in several publications (see e.g. Greenblat & Duke, 1981 Duke & Geurts, 2004).

In this publication we elaborate the design approach as we have applied it in the past years. It is based on the work of Dick Duke and his 'successors', but we have made some (minor) adaptations, based on our own experiences. We first discuss why we actually need a design methodology and how we can achieve a transparent design process. Then we explain in outline the structure of the design process, after which we discuss in the following chapters successively the various steps in the design process. In the last chapter we look briefly at alternative design methodologies. The report concludes with three appendices with background information concerning the design process.

[1] For a description of simulation games and their characteristics, see Van de Westelaken & Peters, 2010 (currently only in Dutch).

2 A methodology for the design process

When designing a simulation game, you can proceed in several ways. At one extreme, there is the modus operandi of the 'artist' who considers designing a simulation game as a creative process. From this perspective, the final product is the touchstone for the success of the design (process) and understanding how the simulation game exactly came about is irrelevant and not to answer (you don't ask Van Gogh how he came to the yellow color of his sunflowers, you just admire them!).

At the other extreme we see the game designer for whom the design is based on craftsmanship; the process is mainly characterized as a systematic approach, which is transparent and (therefor) repeatable.

Of course, each designer of simulation games has his own style and this style will usually be somewhere in between these two extremes ('art' and 'craft')[2].

We feel most at ease with the second approach.

When you have to design a customized simulation game to be used in a specific context for a specific objective, it requires a transparent design process, so you are able to evaluate not only the final product but also the process and its impact on the final result; this will help you, when necessary, to make adjustments. The transparency of the design can be achieved by working according to a (proven) design methodology.

More specifically, we can give the following reasons for working according to a design methodology:

- It enhances structured and systematically working during the design phases, because phases and intermediary products are distinguished, and this it enhances the transparency of the process.
- Usually several people are involved in the design of a simulation game, organized in a design team; working according to a design methodology makes communication and collaboration between these people easier

[2] With the distinction between the two approaches, we do in no way intent to express a judgment on the quality of the delivered products. The big difference is merely in the approach and the transparency of the process.

- If the final product (or parts) do not meet the targets, it is possible to determine where in the design process choices have been made, that (in hindsight) turned out to be wrong; thus it becomes clear where adjustments need to be made, or from what point the product should be redesigned.
- The correspondence of the simulation game with the real life situation that must be represented (the reference system) is an issue that requires much attention; this is related to the validity of the simulation game (see e.g. Peters et al, 1998). Working according to a systematic method offers more opportunities to guarantee this correspondence and to make checks.
- The facilitators that will guide the simulation game should be well aware of all the ins and outs of the simulation game. Insofar they have not been part of the design team, the facilitators should be informed in a training program about the dynamics of the simulation game, the choices that were made made, and the like. A systematic and transparent design process facilitates the transfer of such information.

We give the following recommendations in order to be transparent while designing simulation games

- Work systematically and methodically, which can be promoted by working according to a plan.
- Avoid to work on your own while developing a simulation game, work with a team; or organize in any case a kind of sounding board; this forces you to formulate your decisions and choices explicitly.
- Communicate constantly with the client, so you know whether you are on the right track; it keeps you alert regarding the transformation of the reference system into a simulation game.
- Take notes of what you are doing and discussing; the design process has an iterative character, so you often fall back on what you've done, how you have come to a decision; having notes and reports can help.
- Describe the intermediate products of the different phases of the project, such as the specifications for the design, system analysis, the concept of the game, which is not only useful for communication internally and with the client, but it is also important to ascertain afterwards where adjustments are needed.
- Always keep in mind why and for whom you are building the simulation game.

Because of these (and other) aspects it is important work systematically and in a structured way. This can be realized in very many and very different ways. Working according to a design methodology is one way to enhance working systematically and transparently, because it provides structure to the complex process of transforming a real life situation (problem) into a simulation game.

In our own work we try as much as possible to proceed according to a design methodology. The design process that we follow is based on the work of Dick Duke, but we gave it in the course of time our own interpretation. The structure and phases of the design process such as recently published in Duke & Geurts (2004) consists of 5 stages and 21 steps; it is shown in Appendix 1 on page 41. We work with a process model that consists of 4 phases and 10 steps, but in essence, the activities correspond to the process model of Duke.

In the following chapters we describe the design process as we generally execute it.

Incidentally, it is not always possible or desirable to proceed according to this method and we must resort to other methods. There are also game builders who use another design methodology. We'll come back to in chapter 10.

3 The design process for building simulation games

The process of designing and applying simulation games for complex problems is shown schematically in Figure 1.

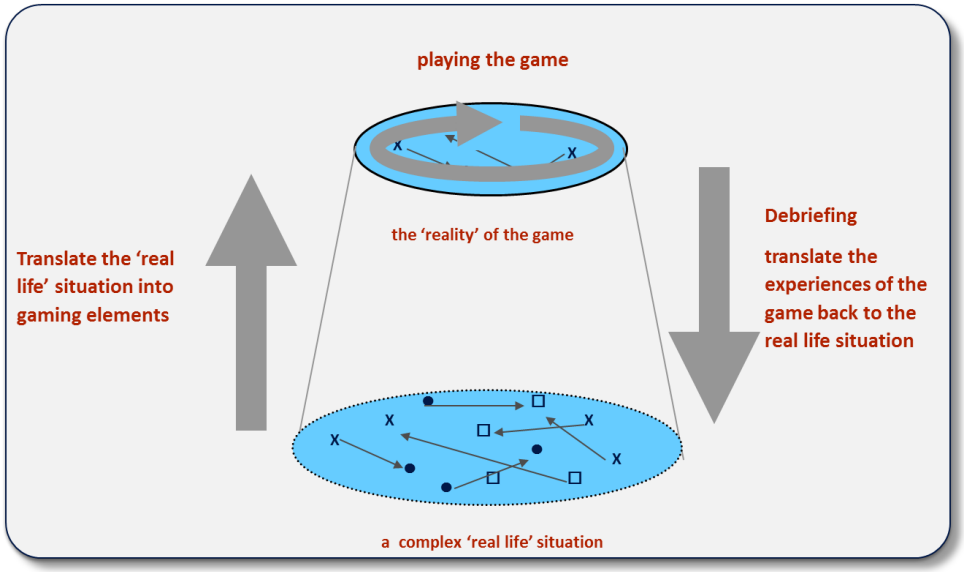


Figure 1 The process of designing and applying simulation games for complex problems (Peters et al., 1998)

The point of departure is a complex problem in the real life situation. This reality (for which also the term 'reference system' is used) is characterized by a numerous aspects and elements of different nature, and manyfold relationships between them. Precisely because of this complexity, the people who work in this reality may lack sufficient overview of the problem area. The goal of

designing a simulation game is to reduce this complex reality into a simpler model. When building this more simple model three principles play a role:

- Reduction — not all elements, distinguished in the real life situation will be represented in the model, only the most pivotal elements are included in the model;
- Abstraction — the elements that will be included in the new model are not necessarily represented as detailed as they are in the real life situation, in other words: the system is abstracted;
- Symbolization — the elements from the real life situation are represented in the new model in a new appearance (c.f. the gaming elements that will be discussed in chapter 7).

In the process of translation from reality to a reduced model (shown by the arrow on the left) four phases can be distinguished, which will be explained later.

When the simulation game has been developed it can be applied: the participants in the simulation game can gain experience in the reduced environment, in other words they can play the game, giving them insight into the nature of (a simplified version of) the complex problem and give them the opportunity to practice new behaviors. If applying the model stops there, then it might be fun playing, but it is of no use for the behavior in the real life situation. Hence the debriefing is an element that is inextricably linked with the implementation of a simulation game: the experience gained in the simulation game should be translated back to the reality of everyday life; that is after all why we started the whole process.

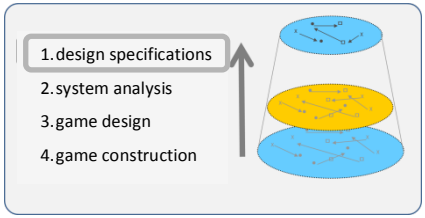
For that matter, the model, as shown above, is in essence not unique to the process of the game design. Other methods that are based on a simulation of reality (such as mathematical models, system dynamic models, physical models) act in accordance with the above cycle. Specific for the case of the game design cycle is that the new model is shaped as a simulation game; its elements and their relationships are transformed into the building blocks of a game: scenarios, events, roles, rules, etc. (see also chapter 7). In the case of a mathematical model, the elements and relationships are represented in the form of variables and functions. But the very fact that you want to design a model in the form of a simulation game has a number of consequences for the design process; we will elaborate them further on in this report.

In the process of designing a simulation game four phases can be distinguished:

- The design specifications
- The system analysis
- The game design
- The game construction.

Within these four phases we have 10 steps. Appendix 2 on page 43 shows a schematic representation of the entire design process.
We first give a brief characterization of each of these phases and steps, after which we will in the following chapters elaborate in detail these steps in the game design process.

3.1 Phase 1: The design specifications



The first phase is the phase of the design specifications. The aim of this phase is to get clear what the purpose of the simulation game is, what the final product should look like, and under what conditions it will be used. In this phase, we distinguish two steps.

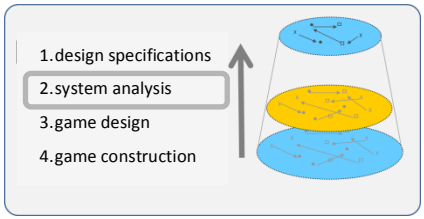
Step 1 The intake

During the intake a consultation takes place with the client about the issues that are to be addressed in the simulation game and the demands of the client. Next, the subject of the simulation game will be (provisionally) delineated. This consultation should lead to an agreement between the client and the designer.

Step 2 Specifications of the design

During this step, an accurate description of the simulation game, as it should be at the end of the project, is made. There are usually several meetings the client. Formulating these specifications is done by means of a checklist, that facilitates with the help of a large number of questions to examine the wishes and requirements of the client as precisely as possible (see appendix 3). Usually these meetings have as a side effect, that the client will formulate the (initially rather global) objectives and requirements clearer. The specifications that are formulated, give on the one hand direction to the rest of the design process, but they also have an important function in the evaluation of the final product.

3.2 Phase 2: The system analysis



The second phase of the design process is the system analysis. The purpose of this phase is the identification of the relevant elements in the reference system and their relationships. Going from the reference system to the game in one single step is very difficult for complex situations (and also at the expense of the transparency of the design); therefore, in the system analysis is an intermediary representation of the reference system is created as an extra step towards the game. In the figure above, the level between the reference system and the game (in yellow) indicates this step.

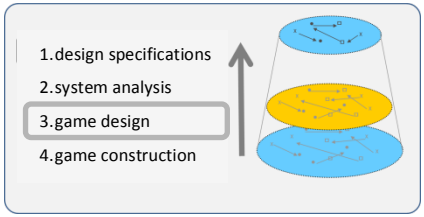
Step 3 The system analysis

The purpose of this phase is to make a detailed description of the problem area. The relevant factors and actors are identified, together with the relationships. This is done by means of interviews with key informants and studying documents. The system analysis usually results in a schematic representation of the problem context, referred to as the "schematic". When developing a schematic the information from the interviews and document analysis is usually displayed on small cards, referred to as theme cards or snow cards, which are then categorized and combined into meaningful categories, representing actors, variables, elements, relationships, et cetera. This approach is therefore basically 'bottom-up'.

During the system analysis, the aim is to provide a description of the problem context as complete as possible (and necessary). Only with a complete overview at hand you can (later) come to the sound selection of elements for the simulation game. During the remainder of the design process, the system analysis serves as the basis or starting point for further design activities.

The system analysis usually takes a long time. Practice shows that the first three phases of the development process may require over 50% of the total design time.

3.3 Phase 3: The game design



During the phase of the game design the translation of reality, as represented in the system analysis, into the game is realized. This phase involves a search for a suitable metaphor and a suitable game format. The game gradually gets shape, that is to say, on paper, because in this phase 'only' the game concept is elaborated. This game concept can be compared with the plan for the construction of a house: everything is worked out in detail on paper in order to get/give a detailed impression of the house that will be built. Only when the client accepts the game concept, you can proceed to the next phase for the actual construction of the game.

The phase of the game design consists of four steps.

Step 4 Selection of the system components

This step marks the transition from the phase of the system analysis to the phase of the game design. The systems analysis has led to a large number of factors that one way or another are important in the problem context. It is obviously impossible for all these elements to be included in the simulation game, hence in this step aims at selecting the system components that are most relevant and therefore should be included in the simulation game. In this step the principles of reduction and abstraction take place.

Step 5 The matrix of system components and gaming elements

A simulation game is composed of various elements, such as a scenario, unexpected events, roles, rules and accounting system. This step examines how each of the system components, selected in the preceding step, are represented in the simulation game, i.e. how they should be translated into the gaming elements. In order to make this translation systematic and smooth, a matrix is used in which the columns represent the system components and the rows of the gaming elements. Through brainstorming each cell of the matrix is filled as much as possible. In this step the principle of symbolization comes to live.

Step 6 The choice for a game format

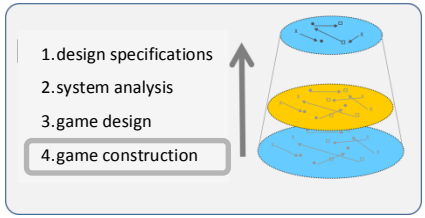
In the previous step for each system component is indicated how it can be represented in the simulation game. In this sixth step all the information in the matrix is summarized and each game component is described. As a result, it becomes clear what information should, for example, be included in the scenario of the game, which roles are to be distinguished, etcetera. In other words, the simulation game begins to take shape. In this phase, the 'final' choice for the game format made: a board game, a paper-based game, a computer-based game, a web-based game, et cetera.

Step 7 The game on paper

The elements that in the previous steps have been elaborated as separate parts are in this step combined into a whole. The simulation game, as it begins to take shape, is described. This description clarifies how the system components are reflected in the simulation game (this is a summary for each column of the matrix), and for each gaming element is elaborated how it exactly will look like and how it is composed (this represents a summary for each row of the matrix). Describing the simulation game on paper has a summarizing function, but also an evaluating function: it allows the designer to ensure that all required system components are sufficiently addressed, or that the roles are not too heavy, or that there are no inconsistencies between the various elements, et cetera.

3.4 Phase 4: The game construction and the transfer to the client

In the final stage of the design process, the simulation game actually is being built. The concepts and ideas are now converted into tangible products. This is not a simple production process, because in this phase the simulation game also extensively tested, resulting in changes in the concept and the actual product. The transfer of the simulation game to the client and the training of facilitators close this phase and thus the entire design process.



Step 8 The construction of the simulation game

In this step, the components of the simulation game, as they are described in the previous step are developed. That is to say that all the elements are to be elaborated in detail, and that the materials and devices are manufactured. Also the game is 'loaded', i.e. for all elements that require this, appropriate values are determined, describing the starting situation of the game. These values have to constitute a consistent system.

Step 9 Test and improve

The activities of the previous step are alternated with tests of the simulation game. Each test results in adjustments that have to be processed again. Testing the simulation game is done using the so-called 'rule of ten', a sequence of tests from global to specific, and from testing single aspects to testing the entire simulation game. In this test phase we distinguish several types of tests: 'talk troughs', 'walk troughs', test runs and finally a dress rehearsal.

Step 10 The transfer to the client

If the simulation game has its final shape and the tests are completed satisfactorily, then the simulation game is finalized and transferred to the client. This transfer usually implies that there should be a training of the persons who are going to run and lead the simulation game, the facilitators.

The steps of the design process have been described above as steps that follow each other, hence giving the impression that the design process is linear: begin at step 1 and work through the following steps in sequence. In practice, however, the design process is an iterative process, in which there are regular jumps back and forth between the different steps. The progress of the design process requires, that the first phase is completed before the second phase is started, the same applies to the transition between the second and third phase. These phases are concluded with a document that should be authorized by the client. Within the phases, however, the steps will be passed several times, and not necessarily in the order as described. Thinking about or working on a later aspect often provides clarity regarding an earlier decision or an earlier choice.

Now we have described the design process in global terms, we will elaborate some of the procedures in more detail in the next chapters.

4 Design specifications for a simulation game

It is important to have in advance the clearest possible picture of the problem the simulation game should focus on, the context in which this problem manifests itself, and the expectations of the client concerning the development of the simulation game. Therefore, the design specifications are prepared as a first step. These specifications are similar to the program requirements, as it is used in the construction of a house: they exactly state how the final product should look, how it should be achieved, et cetera.

These specifications (also called 'specs') do not only have an important role in the design process of the simulation game, but they are also important for the evaluation of the final product.

In one or more interviews with the client and other stakeholders information is collected about the following six topics:

- The background of the problem that is to be represented in the simulation game
- Goals of the simulation game
- The design process
- General considerations for the design
- Elements of the simulation game
- The use of the simulation game.

Appendix 3 provides a checklist of questions[3] for each of these six topics that may be addressed during the first meetings with the client (the intake). It will in many cases not be possible to get an answer to all aspects in advance, because the client may not have thought of many of the issues raised, or it is too early to make a decision already. It is useful to properly keep track of which elements have not yet been agreed and address them at a later stage as yet. The more complete the information provided in this phase is collected, the more accurate design specifications can be formulated.

The design specifications are described in a report, the 'Specs'. This report describes what the ideas of the client are about the final product. The 6 main topics, as mentioned before, offer a workable structure for the setup of this report. The report should be understandable by the client, and therefor it is good to avoid game designers jargon, but to be as explicit as necessary. The

[3] The list as presented in the appendix is an elaboration of earlier work of Greenblat and Duke (1981).

specs not only give a description of what has been decided, but also the issues that still have to be decided upon are mentioned.

The ‘Specs’ serves as the starting point for the design process. As this report will play an important role in the management of the design and the evaluation of the final product, it is important that the client authorizes the report.

5 The system analysis

5.1 Purpose

The purpose of the system analysis is to produce a detailed description of the problem context, i.e. the real life situation. This description is the basis for the further design process: it helps in deciding which elements should be included in the simulation game, which roles are to be represented in the simulation and how those roles are related to each other, what means a role should have at its disposal, what additional rules are necessary to run the game properly, etcetera. The results of a system analysis per se are usually of great value, because they give a compact but detailed description of the problem under investigation. However, the primary importance of system analysis for this design process is that we have a clear description as starting point for the next steps in the design process. This implies that when performing the system analysis, from the start on the intended goal of the design process, namely building a simulation game, determines how the system analysis will be performed and what output will be delivered. In other words, a system analysis to design a simulation in the form of a mathematical model will look completely different from a system analysis that forms the basis for the development of a simulation game.

The purpose of the system analysis also determines the degree of detail. There is a certain tension: on the one hand, it is the intention of the system analysis to create a detailed and comprehensive description of the problem area, so that an underpinned decision can be made concerning the inclusion or exclusion of factors (reduction) or about the details that may be omitted (abstraction). On the other hand it makes little sense to include as many elements and details as possible in a system analysis since an abundance of details may distract from the main issues. Where the line can be drawn is usually inferred from the specifications for the design: that's where the objective of the simulation game is set, and if forms the basis for the decision about the level of detail and comprehensiveness of the system analysis.

5.2 Actors as the starting point

A system analysis can be set about in a variety of ways. To make a detailed description of a complex problem, you can operate from several perspectives. One way to work systematically is to investigate the elements of the system and determine the relations between these elements. We give a few examples of elements and their relations that may be the starting point is a system analysis:

- Elements (categories)
  - Phases of a process (e.g. the decision process)
  - Units of knowledge or information (e.g. documents)
  - (Theoretical) concepts
  - Actors / stakeholders (person, departments, organizations)
- Relations between the elements
  - Responsibilities (assignments - justifications)
  - Exchange of resources (money, means, materials)
  - Exchange of knowledge or information
  - Causes and consequences.

A way of working that seems to be very suitable for the system analysis for simulation games and that has proven its merits, is by taking the actors or stakeholders of the problem context as the starting point for the system analysis.
The final product we aim for is a simulation game. A simulation game is characterized by several roles interacting with each other in a simulated environment. In a simulation game these roles take a pivotal position, and their mutual interactions and their interactions with the environment they are placed in, are the point of application for the learning process. It is therefore obvious, to take the counterpart of the roles in the game, namely the actors in the real life situation, as departure point for the system analysis.

In concrete terms this means, that during the system analysis at first you start to identify who the actors are, what their objectives, interests, constraints, competences, resources, options, means et cetera are. Next, the relations between the actors are established and elaborated. These relations can be rather divers: it may concern a (hierarchical) authority relationship, a request for information, money or means, flows of information, money or resources, giving assignments or provide accountability, asking for advise or giving advise, making an assessment, and so on.

Although an approach in which actors and their relations are the basis for the system analysis may be obvious, it is certainly not the only possible approach. In fact, each approach that helps to systematically clarify the problems in the reference system, answers the purpose.

5.3 Procedure

In executing a system analysis in the context of the design process of a simulation game, two approaches can be distinguished. The first approach is a top-down approach in which you start from a specific, well-defined conception / definition of the problem, and describe all aspects of the problem in terms of this conception.

The other approach is a bottom-up approach, where you create an image about the problem out of the loose observable elements of the problem situation. Especially when making a system analysis of a complex reference system a bottom-up approach seems obvious. Given the particular nature of the complex problem, an overall picture or a global perspective of the situation and the problem where the loose elements can be organized is missing. On the contrary, it is one of the goals of the system analysis to create such an image or to develop such a perspective. That can be accomplished via a bottom-up approach.

In executing a system analysis the following steps may be distinguished:

- Collecting the loose elements
- Establishing the relations between these elements
- Describing the system
- Visualizing the system.

When thinking about techniques that can be applied to collect the loose elements of the reference system there are hardly any restrictions. The intention is to distinguish as much elements of problem situation as possible (or feasible) and to relate these elements. To do this you can use interviews with key informants, brainstorming with key informants, literature study (or actually a literature 'scan'), document analysis, and observation of the processes in the problem context. All these techniques aim at collecting as many elements, without initially being concerned about the way in which those elements are related. Ending up with a quantity of 250 separate themes and aspects is not unusual.

During the second step, the loose elements are related to each other. Clustering the loose elements is a common technique here. Here again the top-down clustering can take place (the elements are grouped into categories defined in advance) or bottom-up (the clustering categories are formed according to the characteristics of the loose elements). Then the relationships between the clusters are established and the possible influence of the clusters themselves. Doing so creates an overview of the most important elements of the reference system and how they affect each other.

These findings are recorded in a report, so they are always available for further use in the design process. This report generally is not in the form of a detailed description, but rather as a series of tables and relationship diagrams. Often the results of the system analysis are displayed as a visual representation. Such a representation, which is also known as schematic, is a compact, but very expressive tool, because it gives at a glance a comprehensive overview of the key elements of the problematic situation and their interdependence. The dynamics of a problem is much better reflected in a schematic than in a description: a picture says more than a thousand words.

In the gaming discipline very beautiful and detailed schematics are created. On the right is an example of a schematic as it has been developed for the description of the processes that affect the ecological system of the Great Lakes in the United States. The documentation for this schematic mentions that this is a 'simplified version'!

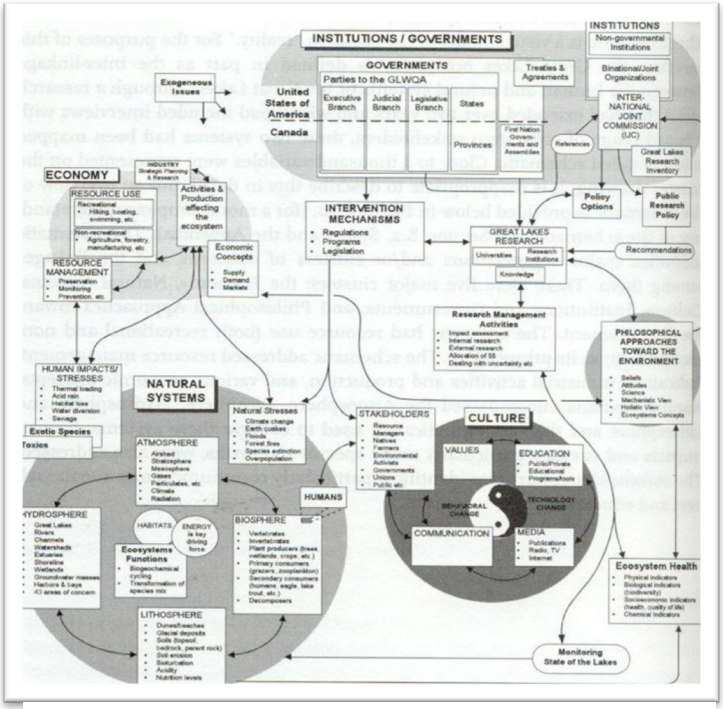


Figure 2 Example of a schematic (Duke & Geurts, p. 132).

For the client a schematic often is a revelation, because he sees (maybe for the first time) a complete overview of how the problem actually is/can be seen. Clients often like to have a number of copies of the schematic; for the game designers this is a reason to put extra effort into a nicely formatted design of the schematic. For the design process per se a nicely formatted schematic is not necessary: if only the schematic gives a good overview and provides insight into the dynamics of the problem, then it is functional for the purpose for which it's made.

6 The game design

This chapter focuses on the game design phase, in which we distinguish four steps, which we will elaborate. At first, we will specify the purpose of this phase.

6.1 Purpose

The game design phase is the bridge between the system analysis and the game construction. At the beginning of this phase, there is the detailed description of the reference system; at the end of this phase, such decisions have been taken, that you are ready for the construction (i.e. the manufacturing of the parts of the game) and the tests of the game. This phase should, therefore, effectuate the translation of the 'reality' to the 'reality of the game'. As indicated in chapter 3 three factors play a crucial role in this process: reduction, abstraction and symbolization.

In the game design phase creative processes are important. After all, translating elements from a real problem context into the elements that make up a game is not something that can be enforced with analytical processes or algorithms; creativity, imagination and experience are important tools. The fact that relatively intangible skills like creativity and experience have such a crucial part in the design process, does, however, not in any way imply that this process should be less structured. The steps, which are described below, aim on finding a good balance between creativity and accountability.

6.2 The steps

As mentioned in chapter 3, in this phase we may distinguish four steps. These four steps are:

- Step 4 Selection of the system components
- Step 5 The matrix of system components and gaming elements
- Step 6 The choice for a game format
- Step 7 The game on paper.

The results of the three preceding steps are the starting point (input) for the steps of the design phase. This means that *the specifications for the design*, in which the ideas and desires of the client are set out, and *the results of the system analysis*, in which the problem and its context are described in detail, are indispensable documents for the elaboration of the steps of the game

design phase. The specifications for the design (the ‘specs’) usually have the form of a rather extensive written report; this is because these specifications play an important role in the communication with the client; the client should authorize this report. The results of the system analysis do strictly speaking not have to be elaborated into a sophisticated report and a nice looking schematic. In practice the image that the designers develop of the problem area, emerges from all kinds of scratch drawings and loose notes. The image that comes to life with the designers during the phase of the system analysis, is much more complete than whatever textual or graphic representation. However, it is necessary that this (mental) image in one way or another is recorded in a physical product. You have the 'big picture' usually in your head, but the details, such as the exact nature of the relationships between actors, must be recorded in a report. And especially in a situation, in which multiple designers are involved in the process, it is necessary that they have the same vision on the system, and in that case a diagram and their descriptions are indispensable. At the start of the design phase both basic documents are available.

6.3 Procedure

The four steps of the game design phase are described in the above listing as consecutive steps that follow each other. This might give the impression, that the design process is executed as a linear process: start at the selection of the system components and work successively through the following steps. The practice of designing simulation game shows, however, that such a view about the design process does not justice to real practice. Although you can start with the selection of system components, this should be considered as a provisional selection, because later steps may lead to the conclusion that certain system components must be included or be left out. The next two steps indicate that first the matrix is filled and then the game format is chosen and elaborated. In practice, however, we will only be able to make decisions about how to fill in the matrix, if we have a (rough) notion of the game format. But the game format can only be elaborated, when you systematically have thought about the design and the content of the game, for which the matrix is an important tool. In addition, all kinds of new ideas emerge at the moment that you write down all ideas and decisions (in step 8).

In practice the steps of the game design phase alternate regularly and the game designer jumps back and forth between the various activities carried out in the different steps: therefore, it is an iterative process.

6.4 The matrix of system components and gaming elements

The importance of the matrix in the game design process is hard to underestimate: it is used as a means to capture all ideas, thoughts, suggestions, detailed plans, decisions, et cetera, in a systematic way. As a result, all decisions made about the way in which system components get a place in the game, made explicit. This is an important tool for the communication between members of the design team (and possibly between the game designers and the client). In addition, a matrix, once richly and systematically filled, gives the possibility to determine whether the game is well balanced designed and whether all system components are represented adequately.

The columns of the matrix are formed by the system components that are selected in the previous step. In the rows of the matrix are the gaming elements, which together form the game. In the literature 10 to 15 gaming elements are distinguished. In Chapter 7, we describe the gaming elements, which have to be elaborated during the design process.

In the literature it is suggested, that you can use the matrix by systematically go from cell to cell and brainstorm per cell about whether and how the system component can be represented in or by the gaming element. This approach assumes that you have some 'big picture' of what the game is going to look like. And that you are able to systematically assign all components to gaming elements. In that view, the matrix is a tool to structure the thinking process.

There is also another way to use the matrix. When the moment has come to consider the translation of the system components into a simulation game, you can start with an open brainstorming about what the game may look like, which roles there are, what interaction between the roles take place, and so on; while doing so the simulation game and various aspects of it comes to live. All the ideas that come to the surface during this brainstorming can be written down in the matrix in the appropriate cell. The process of generating the ideas itself is thereby not necessarily systematically but has more the character of a associative brainstorming; all ideas, wishes, suggestions and so on are immediately recorded in the matrix, to avoid that they will be lost. When used in this way, the function of the matrix is (in each case at first) not primarily to structure the process of generating ideas, but rather to capture the products of a non-systematic idea generating process in a systematic way. At the moment that the first flow of ideas decreases and the matrix is already reasonably filled, the mode of operation may change. From that moment, the matrix is checked cell by cell, or column by column (system component by system component) to ensure that all aspects of a system component have been addressed.

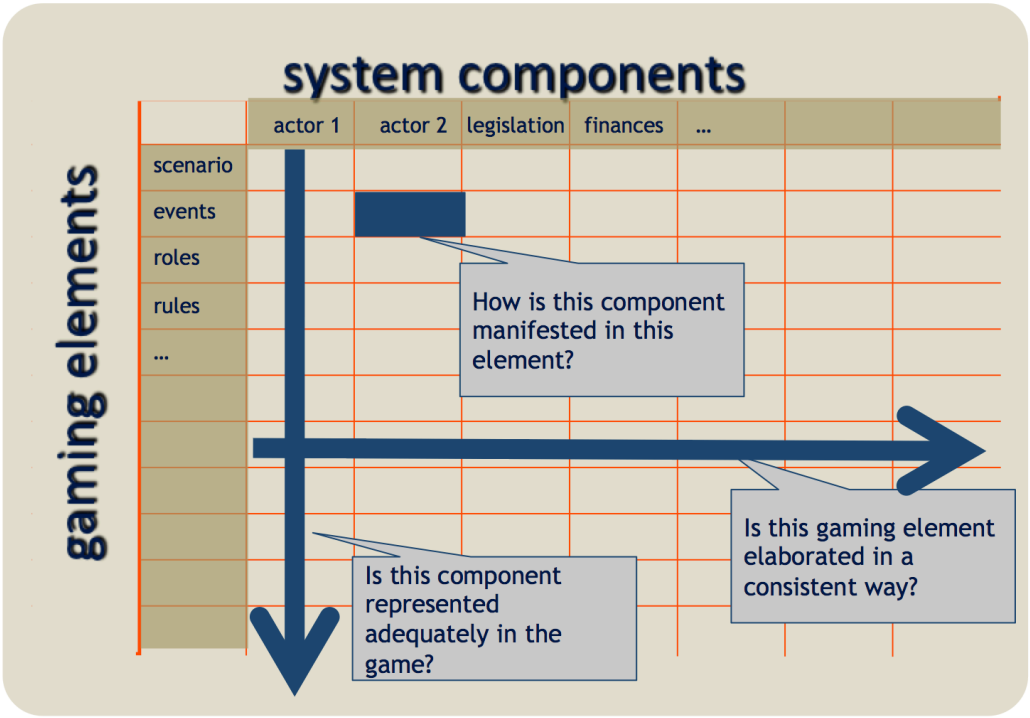


Figure 3 The system components – gaming elements matrix

6.5 The report of the game concept

The results of the efforts of the game design phase are eventually laid down in a report, in which the game concept is described. Earlier we have compared the specifications of design with the program of requirements, such as formulated in the construction of a house. Sticking to the same metaphor, then the report in which the game concept is described, can be compared with the engineering drawing: everything is elaborated and described in detail, before the first spade is put in the ground or the first nail is hammered. The same holds for this concept report: the simulation game is described extensively, before any part is produced. Writing such a document has at least two functions. On the one hand a clear picture of the simulation game-in-the-making emerges, not only of the separate elements, but also the dynamics of the simulation. On the

other hand, writing the report of the game concept also has as a function that a final check can be carried out with the customer whether the simulation game-in-the-making still reflects the wishes and ideas of the customer. Writing the report is not the final one-time activity of this phase. Usually you start in an early stage with describing the simulation game, since while describing the game concept ambiguities or inconsistencies in the design may come to light, which is the occasion to go back a few steps in the process. Together with using the matrix to organize the ideas, writing this report may be considered as a way to systematically coordinate the ideas and check on their consistency.

Below is a possible structure of the report. This structure covers all the necessary elements.

1. The objective **of** the simulation game
2. The participants
3. The scenario
4. The objective **in** the simulation game
5. The macro cycle
6. The micro cycle
7. The roles
   - played roles
   - simulated roles
   - pseudo roles
8. Events
   - planned, random, ad hoc
9. Rules
10. Other elements
11. Indicators / assessment criteria
12. Data
13. Tools and paraphernalia
14. Rules for the implementation of the simulation game (preparation, facilitation, safety of the participants)

Figure 4 Possible set-up of the game concept report

7 The gaming elements

A simulation game is made up of different elements. In this chapter we describe those elements and indicate what their function is in the simulation game.

7.1 The scenario

In the scenario the game context is described. The scenario may be a text, but it can also have the form of a PowerPoint presentation, a film, or a combination. The scenario contains a sketch of the situation of the simulation game and the elements that are relevant to the game context. In other words, the scenario is the description of the reality of the game. Texts, tables, graphs, diagrams, videos, etc. provide a sketch of the game context, explains who the key players are and what their tasks are, tells about the rules of play, et cetera. The participants read at the beginning of the simulation game this scenario (or look at the presentation). After this, they must have a clear idea of the game context and understand and 'feel' their position in this new reality.

7.2 Unexpected events

In the scenario the structure of the simulation game is described, with particular emphasis on the fixed or constant elements of the game context. Unexpected events give the possibility to introduce new elements in the scenario and change the course of the game. Events form an important tool to regulate the dynamics of the simulation game. In addition, they can be used to focus the attention of the participants on specific elements or to repel unwanted developments. Another possible function of events is that they may increase the complexity of the simulation game by introducing new elements. We can distinguish several types of unexpected events:

Planned events

Events are incidents that occur unexpectedly during a simulation game. In this context the name 'planned events' may sound odd (planned and yet unexpected). But nevertheless, it is the most common category of events. During the game design it is exactly determined which event will be introduced at which moment. Both the time and the content of the event is exactly planned; however, the event pops up unexpectedly for the participants. These types of events are used to direct the simulation game in a predetermined direction or to introduce new complexity.

Random events

For this category the moment when an event occurs is determined, but what that event is, is not fixed. There is a collection of predetermined incidents, and at a special moment the participants get one of them and have to follow the instructions. Compare this situation with the game Monopoly, where it Is in the rules when you have to take one card from a deck of chance cards, but which card you draw depends on chance. This type of events is used to introduce chance within the scenario; dependent on the events that occur, the game will have a different course.

Ad hoc events

If the facilitator is very well aware of the structure and dynamics of the simulation game, then he can devise an event on the spot, when there proves to be a need for that. For example, when a group of participants performs so well, that they do not encounter not to certain problems, then the facilitator may come up with a tailored event, causing that group to be confronted with additional problems. This category of unexpected events is applicable in simulations game with a relatively open structure (it must be possible to introduce elements ad hoc).

7.3 The roles

In a simulation game the roles[4] have a very important position. Characteristics and properties are assigned to a role, and these characteristics and properties determine the actions of the one who represents (plays) the role. A role represents a specific perspective towards the subject of the simulation game. The roles typically differ in terms of the goals, responsibilities, authority, options, resources, interests, etc., in respect to the problem. The set of roles in the simulation game represents the most perspectives of the most important stakeholders in relation to the objective for which the simulation game is developed.

There are three types of roles in simulation games:

Played roles

These are the roles that are played by participants during the simulation game. Each participant is assigned a specific role and he acts accordingly during the simulation game: all actions and

[4] The term role, as it is used here, should not be confused with the concept of role, as used in role-plays. In role-play the role is simulated; in advance it is indicated how one should react in a particular situation. In simulation games the environment is simulated, but within that environment the interactions are not steered (behavior is authentic). The participant's actions are based on their interpretation of the functions and duties assigned to them (= role).

decisions are carried out, respectively taken from the perspective of this role. It is characteristic for simulation games that the outline of a role is determined (tasks, means, et cetera), but how a participant gives substance to this role is left to the judgment of the participant. By playing this role and by acting from the perspective of this role, and by the confrontations between the different roles, participants come to understand the complexity of the problem context, and they get the chance achieve the (learning) objectives that have to be reached by the simulation game.

During the debriefing the performance of the participants who have a played role, is discussed and evaluated.

Pseudo roles

These are roles that are actively played during the simulation game, but not by the participants. Usually the facilitators take care of these roles; you can also use (theatre) actors for this type of role. It concerns roles that are important for running the simulation game (and for the insight into the complexity), but playing such a role is not interesting or possible for participants, either because these roles may be less interesting in the context of the learning process of the participants, or because performing these roles requires a very large level of knowledge and understanding. Therefor a member of the facilitation staff plays this role. For instance, you can introduce in a simulation game the role of consultant (or government); this consultant (or government) provides the participants then during the game with new information or new guidelines. A characteristic of pseudo roles is that they are not subject for evaluation in the accounting system (see below) or during the debriefing.

Simulated roles

Simulated roles are not played, nor by one of the participants, nor by a facilitator. These roles are important for the course of the game, but it is not necessary that they are actually played. Instead, these roles may occur, for example, in the form of a data file, or as cards that represent the actor / role. As an illustration we can think of a simulation game, in which the alignment and coordination of the activities of the various institutions involved in the mediation of job seekers, is the learning objective. The 'job seekers' are an important actor in this process (e.g. how satisfied are they about the services, how many actually get a job); it is, however, not necessary that this role is actually played by a person. Instead, each ‘job seeker’ is represented by a card (or a record in a database), on which several characteristics of the ‘job seeker’ can be found.

7.4 The cycles and the steps of play

A simulation game is made up of a series of steps, which are executed consecutively; there may be several rounds in which these steps are ran through. For each round and for each step a certain amount of time is allocated. In the setup of a simulation game two types of cycles can be distinguished, namely the macro cycle and the micro cycle.

The macro cycle

The macro cycle concerns the setup of the entire simulation game: the preparation, the introduction, playing one or several rounds, the debriefing and evaluation. If there are several game rounds, then the macro cycle designates how these rounds are related to each other. The first round has often the character of a 'muddling along round' in which the participants get acquainted with the scenario and their roles, and in which they get to know the routines of the game. In the consecutive rounds the complexity of the subject is increased gradually, making the participants get to know new aspects of the problem, have to apply other skills and knowledge, and may test experiences from previous rounds. The macro cycle is tailored to the goals of the simulation game; in other words, the macro cycle (the game setup) must be designed in such a way that the objectives, for which the simulation game was developed, can be realized.

The micro cycle and steps of play

The micro cycle concerns the sequence of activities and actions within each round. The micro cycle is elaborated in the steps of play. The actions that the participants should perform in a game round are divided into a number of steps, which are processed in succession. A specific amount of time is allocated to each step. In the initial round(s) the allotted time will be monitored very carefully; as the game proceeds, the tight time schedule can be released: the participants will have more freedom to plan the steps to their own insight. Especially when there are multiple roles in the simulation game, each with its own sequence of actions, the tuning of all these separate cycles to each other listens very carefully.

As explained in the previous section, the macro cycle focuses mainly on the objectives **of** the simulation game; the micro cycle, in contrast, is especially focused on the objectives **in** the simulation game. Executing the steps of play aims at accomplishing the task that has been given to individuals or groups within the simulation game.

The relation between the macro and the micro cycles can be expressed as follows: a macro cycle consists of preparation, briefing, a series of micro cycles, debriefing and evaluation.

7.5 Rules

Rules in a simulation game are used to direct the behavior of the participants. In a simulation game there are already very many opportunities to direct the behavior of participants, such as the scenario, unexpected events, the role description and the steps of play. Sometimes additional rules are needed, for example to regulate the interactions between the participants. Since rules restrict the freedom of action of the participants, game designers generally honor the principle that the number of additional game rules should be kept to a minimum.

Participants should not experience rules as external, unnatural or imposed. A way to give game rules a 'natural' character is by including them one way or the other in the scenario, e.g. in some kind of regulations.

For example, the rules concerning the negotiation between two actors (‘you may negotiate with another actor only once in a round’) can be determined via 'bylaws'; these byelaws are part of the scenario.

Rules can be established for the duration of the simulation game, but you can also design a simulation game in such a way that rules may be introduced, amended or abolished by the participants themselves. So it could be that ‘Bylaws’ are valid for two years, and they may be modified by mutual agreement.

7.6 Decisions

During the steps of play the participants have to take several decisions. These decisions are of influence on the course of the game. It is important to have an overview of all decisions that may be taken and their consequences, or at least of the most obvious decisions. To get such an overview you may create a matrix during the design phase, in which the game steps are set against the decisions that can be taken. Such a matrix offers the opportunity to check whether the information and resources needed to make a decision are available in time during the game play. In addition, the connection between the different steps of play becomes visible and it is possible to check how the decisions taken by the various roles influence each other. Such a systematic overview of the decisions may also be useful in the subsequent discussion of the game rounds and at the debriefing, because it increases the transparency of the process in the game.

7.7 Data

In order to perform their tasks properly, participants need to have information at their disposal. This information is necessary for taking decision or for estimating the consequences of the decisions. The type of provided data can vary from raw data, for which participants must find a good interpretation, to ready-to-use information, in which an interpretation is already made. Part of the data may already be presented in the scenario, but there may also be a need for additional information. Part of these additional data can be common and available for all roles, other information will only be disclosed to certain roles; participants will have to find ways in the game itself how to share or communicate that information with other roles. The information can be made available in a variety of forms: in tables, charts, overviews, through indicators and symbols (see below), or via a computer database.

7.8 Indicators

The performance of each (played) role in the simulation game should be assessed on the basis of some criterion. What criterion this is, can usually be derived from the objectives of the role. By using indicators the performance of the participants (roles) is made visible. Via the accounting system (see below) a performance score is determined for the participants and this score is made visible in some way (such as tables and charts, special symbols). Indicators can be various; there may be quantitative indicators (for example, the number of job-seekers that are helped to a job) but also qualitative indicators (e.g. the satisfaction of the job-seekers).

7.9 The accounting system

The accounting system is the set of rules, with which a score can be calculated for each of the indicators. During the game the participants take decisions or they produce ‘products’. Through the accounting system a score is calculated indicating the performance level of the actions of the participants.

Each game has its own accounting system, depending on the behaviors and the results should be honored. The rules for assessing the performance therefore differ greatly, from a simple algorithm to extremely complex combinations of criteria. Sometimes calculations can be made easily by hand, by counting objects or adding some numbers, in other cases, a computer-program is needed to make the calculations.

7.10 Paraphernalia

Finally, there are the paraphernalia, a nice term that refers to any objects and tools, needed to run the simulation game. You can think of nametags and badges, pens and markers, scratch paper, scissors, markers, paper clips, pins, tape and glue, yellow sticky notes, calculators for the facilitators and, optionally, for the participants, computers with necessary software, a beamer or a projector, in other words all that is needed by the participants and the facilitators to perform their functions satisfactorily.

8 The game construction and the transfer

If the game concept is determined, as described in concept report, the last phase of the game design process, in which the game is actually constructed, starts. In chapter 3 we mentioned already the steps that are involved:

- Step 8 The construction of the simulation game
- Step 9 Test and improve
- Step 10 The transfer

This phase is also characterized by the fact that it is not a matter of sequentially going through the steps, but in a process of 'trial and error' you reach gradually to the definitive version of the simulation game. And while working on the steps of this construction phase, you may decide to go back to the previous phase, since some flaws in the concept now emerge.

8.1 The construction

The construction of the game is about manufacturing the materials needed to run the simulation game. The scenario is written down, the events are made definitive, the role descriptions and the players' manuals are produced, and if applicable the game board is created. Further more, the forms, which may be used, are finalized and all other tools and materials are prepared.

A very laborious task during this step is usually the 'loading' of the simulation game, i.e. to create and attune of all the data that are needed to setup initial situation of the game, according to the scenario; this is the situation the players are confronted with at the start of the game.

It does not make sense to first prepare all materials before the tests begin. As will be seen in the next section, testing often begins with playing a small part of the game. For the preparation of the materials you initially only elaborate those materials and data, that are necessary for the part that is going to be tested. When transforming the ideas into tangible materials, it often becomes clear that some aspects have been overlooked in the conceptual phase or that there are flaws in the concept of the game. For example, it may turn out that, when designing the forms, too many and too detailed information was asked or given. In such cases, you will have to go back a few steps and revise some decisions about the game.

8.2 The testing

Testing the simulation game is, as the word implies, meant to determine whether in practice the game works just like it was imagined in mind and on paper. The concept of testing must be interpreted very broadly. You usually begin with the so-called 'talk through'. Thereby the simulation (or parts thereof) is discussed in detail in order to find out if all information is available and whether there are errors and inconsistencies in the materials. This type of testing is similar to the situation when you explain a card game to someone who is not familiar with that card game: step-by-step you discuss what is happening and how a player should or could react.

A next stage in testing is the so-called 'walk through', whereby the design team plays (a part of) the simulation, each player being responsible for a specific role; at every step the player explains out loud his deliberations and decisions. This can be compared to the next step in explaining a card game: playing with all cards open on the table to make it clear what's happening, so all players have an overview of the entire situation.

After these steps, the moment comes that the simulation game can be tested for the first time with actual players, i.e. members from the target audience (together with the game designers). This first test is limited mostly to one game round or even a part of it. It’s aim is to determine whether the scenario, the manuals and the role descriptions are clear to players, whether all required materials are present and fulfill their functions, whether the desired interaction and dynamics gets going, et cetera. In consecutive tests bigger parts of the game are tested in practice and, where necessary, improvements are implemented.

Finally, the final test is executed. This is the first time that the simulation game is run in its entirety with participants that come from the intended audience. Just like in a 'dress rehearsal', it is the moment that all materials and tools have their final form.

Although many a game designers will never have the felling that the game is complete, then the inevitable moment comes that the simulation is transferred to the customer.

8.3 The transfer

The transfer of the final product implies that the materials are prepared in such a way that the customer can use them later without too much trouble. The materials are given their final form and accompanying documents are elaborated and finalized.

The documentation consists of the following documents:

- A comprehensive roadmap for the facilitators for all the tasks in preparation phase
- An overview of the setup of the room
- Instructions for producing one-time materials (how often should each form be copied, in what color, with what finish).
- An overview of all necessary forms and resources; what resources should be made available for each role
- If applicable: the loading of the game at the start (i.e. setting up the initial situation of the simulation game)
- Directions for the briefing of the game (for example, by means of a PowerPoint presentation)
- Directions for the facilitator for running the game (and optionally to execute pseudo roles)
- Directions for the debriefing.

Even more important than manufacturing a roadmap is, of course, the training of the persons who will run the simulation game as a facilitator. Facilitating a simulation game requires in addition to general instruction or consultation skills a thorough knowledge and understanding of the simulation game itself. A facilitator should know what he should say at what moment and what not, and how he should respond to unforeseen circumstances. The training of the intended facilitators (the train the trainer program) is an activity, which is not to be underestimated.

A good way to set up this training is by involving the intended facilitators already at an early stage in the design of the game. Intended facilitators can play an important role in the designing and filling the matrix that plays an important role in the design (as explained in paragraph 6.4). Additionally, they may study the report with the game concept and judge it. The intended facilitators could be intensively involved in the test phases. When they systematically take part in the different tests their understanding of the simulation game will grow step by step. In this way the training of the facilitators is only a minor additional burden because it becomes integrated in the design process.

Training the facilitators is not limited to the transfer of knowledge about the simulation game, how to use this information, the dynamics of the game, the procedures to be executed, the handling of the events, the calculating of the indicators, the themes for the debriefing, et cetera. It is of probably greater importance to pay attention the skills and attitudes that characterize a good facilitator, and in particular his role in the debriefing. Other than an instructor, whose job it usually is to make clear to the participants what lessons should/can be learned, it is the job of a facilitator to create an environment in which the participants reflect themselves on their actions in the simulation game and draw their conclusions on what they have experienced in the simulation game, and the lessons that can be learned for the real life situation. To that end, the facilitator is supposed to create an atmosphere of mutual trust, to loosen the participants from their roles, to ask the right questions to stimulate the reflection process, to protect persons if they run the risk to get damaged, et cetera.

To prepare persons who are not really experienced in facilitating a simulation game for this role, an intensive training is required.

9 A participative design process

From the description of the phases of the design process in the previous chapters, you may conclude that the process of designing a simulation game could be considered as a participative process in which the client has an important contribution.

The contribution of the client can take three forms:

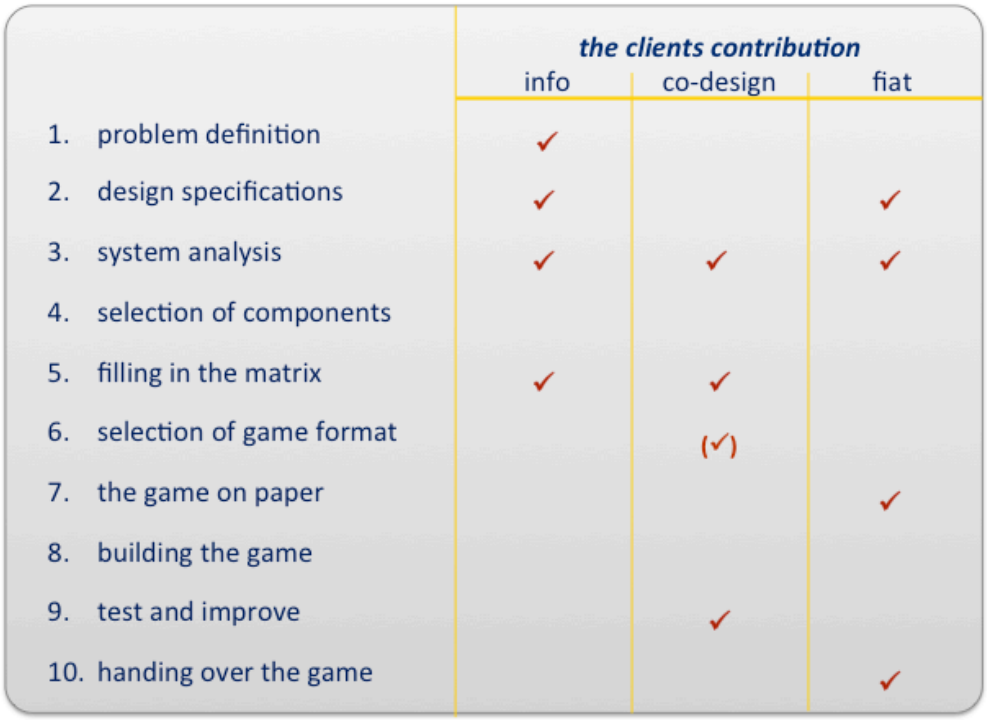
- Providing context information about the problem and the reference system
- Authorizing the intermediate products, which form the basis for the design
- Acting as co-designer.

The first and second tasks are inherent for the role of a client: he is responsible for providing the necessary information and for approving products, monitoring the progress, et cetera. The information, referred to in the first task, is obviously not exclusively provided by the client himself, but several key informants or stakeholders are consulted concerning the problem context.

In the design process, as we have described it, thee interim reports are presented, namely the specifications of design, the system analysis, and the report about the game concept. To enhance communication with the client and to have a clear basis for the evaluation it is advised to have these documents formally approved by the client. Especially when there are different appreciations of the quality of the final product, clear and authorized documents are indispensable.

The role as co-designer and member of the design staff is not required but it is useful from a viewpoint of usability and validity (correspondence with the real life situation). This role can range from occasionally supporting the design staff, to a situation in which one or a some members from the client organization become member of the design team for a longer period of time. The latter situation can be particularly useful for those persons who are going to facilitate the game later.

The table below summarizes for which activities a contribution from the client is desired.



	the clients contribution		
	info	co-design	fiat
1. problem definition	✓		
2. design specifications	✓		✓
3. system analysis	✓	✓	✓
4. selection of components			
5. filling in the matrix	✓	✓	
6. selection of game format		(✓)	
7. the game on paper			✓
8. building the game			
9. test and improve		✓	
10. handing over the game			✓

Figure 5 A participative design process: the role of the client during the design process.

10 Alternative approaches for the design process

In the previous chapters we have described and elaborated a design methodology that is based on the original design methodology of Duke. In that methodology the system analysis takes a prominent place: first we analyze the reference system and make a representation of it, both verbally and in the form of a schedule. This system analysis is the basis for the further design process.

Practice shows that it is not always possible or desirable to make a system analyses.

Some game designers, who strictly work according to a constructivist approach, are convinced that making a system analysis, as previously described, does injustice to the plurality of the visions and views of stakeholders. The system analysis is in fact one perspective on the 'real life' situation, and that one vision forms the basis. In their work they want to postpone this kind of principled choices as long as possible (see e.g.. Van de Meer, 1983; Mastik, 2002).

But there may also be practical reasons to opt out of performing a system analysis. It may, for example, happen that the stakeholders (the informants in the system analysis) have different, sometimes even incompatible views about (parts of) the real life situation. In a systematic analysis these differences become obvious, invite to many discussions and force the game designer to first work on the consensus. An example of such a situation may clarify this.

The simulation game LUMIÈRE is a management game designed for business administration students in the second year of their studies. The students form companies that produce lamps and sell them to a simulated market. During the data collection for the system analysis it became clear that several informants (teachers of the business school) used rather different models, for example with regard to logistics or marketing. For an unambiguous system analysis it is necessary either to unite these different models, or to make a choice for one of the models. Both options bring you as game designer in a situation where you do not want to end up, because it transcends your knowledge and competences. It also seemed that the different views mostly focused on details, which probably would not be important for the simulation game. To ensure the progress of the process it was decided to refrain from an explicit and systematic system analysis as an intermediate step in the design process.

In a situation like this, the game designer can work according a design process that looks like represented in Figure 6.

After drawing up the specifications for design and a quick exploration of the real life situation you start directly working towards a game model, i.e. with the knowledge you have at that moment you start to elaborate a concept for the simulation game, (or a couple of concepts). The risk of such an approach is that concept and the resulting simulation game hardly represents the reference system, i.e. the real life situation. The result may be a nice simulation game, but that has a limited validity regarding the purpose it was designed for. It requires therefore a lot of discipline of the game designer to take measures that prevent this to happen. A repeated confrontation of the choices that are made for the concept with the real life situation is required. The creative process of making a game concept has to be regulated by checking your decisions and choices concerning the game-in-the-making against the objectives of the game (as described in the specifications) and the elementary exploration of the real life situation.

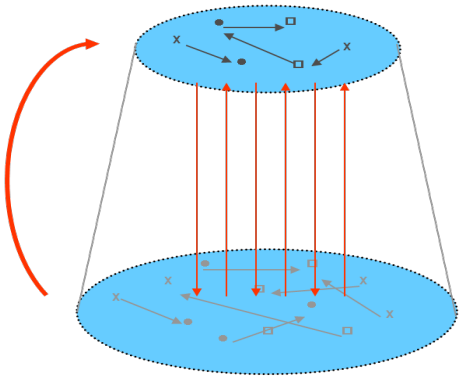


Figure 6 An alternative approach for the design process

This approach may circumvent the risks mentioned above. But one should realize well that the design of the simulation game would be based upon what the game designer initially considers as the most important features of the reference system. In fact, the game designer has executed an implicit (and probably superficial) system analysis that forms the departure point for the first draft of the game. Choices may already have been made during that preliminary step, which determine the further design process without becoming transparent.

Some of the steps we have described earlier can be useful in this 'shortened' approach. Especially the matrix of system components and gaming elements is a very powerful tool to systematically check the correspondence between the game-in-the-making and the specifications. And of course, the tests are of utmost importance to see if the simulation game does what it is supposed to do.

When applied properly, this procedure results faster in a final simulation game than the extensive design process we described before. Work according to this methodology, however, requires a lot of experience of the game designer and makes greater demands on the accountability of the process and products, because the steps are less transparent.

By the way, in the case of LUMIÈRE this procedure was very successful, because in the many discussions of the game concept and the game-in-the-making (and eventually the final game) showed that all involved experts were satisfied about in the way the notion of 'running a business' was shaped in the game (in relation to the learning objectives).

Finally

We have come to the end of this report on designing simulation games. We have mainly focused on the design methodology for interactive simulations game in the tradition of Duke. This approach has proved its worth for many game designers, but as we indicated above it is not the only approach. Several authors (such as Ellington et al, 1982; Thiagarajan, 2003) have written down their own modus operandi (approaches), with which these methods have become available for other game designers. The website of Thiagi (www.thiagi.com) presents e-workshops for learning how to design simulations games. Currently, there is an increasing amount of literature on 'game design'. Many of these sources relate to the design of computer-based games, where rather different principles and procedures play a role. For the designers of interactive simulation games there may still be a lot to learn from other design processes, such as designing computer games.

11 Bibliography

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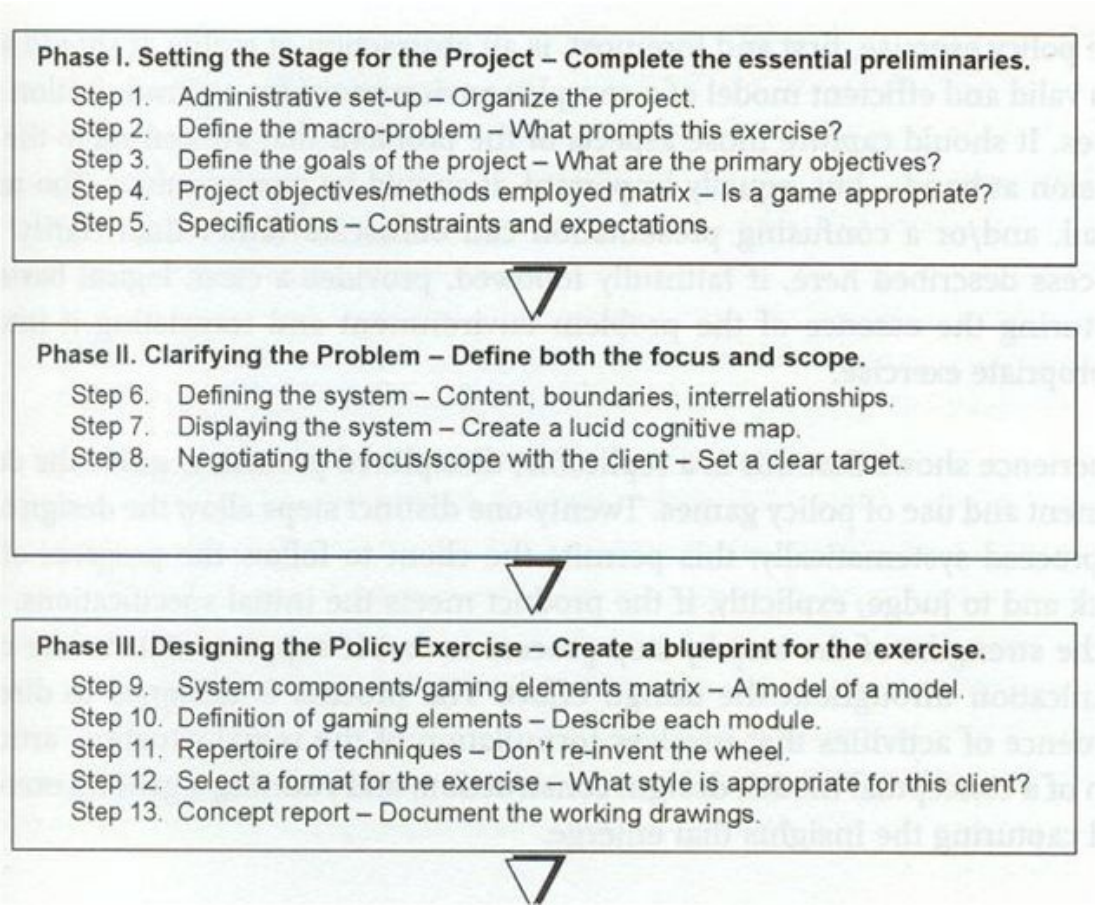
Additional information

Thee website **www.samenspraakadvies.nl/gamelit** gives access to a database with many references about simulation games.

Appendix 1 The design process according to Duke

Source: Duke & Geurts, 2004, p. 277



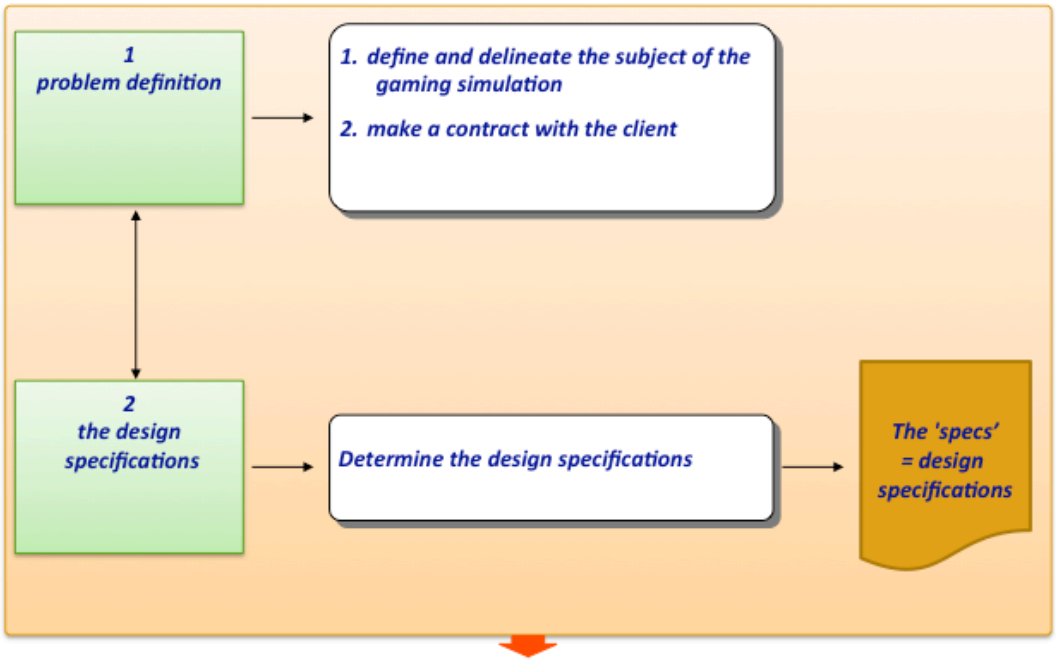
Phase IV. Developing the Exercise – Complete the rule of ten test runs.

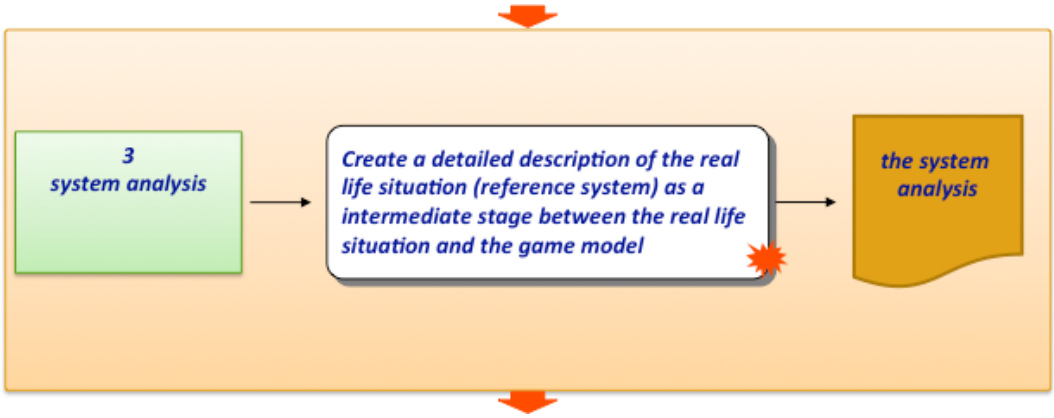
Step 14. Build, test and modify a prototype exercise – Put the pieces together.
Step 15. Technical evaluation – Ensure an efficient and effective tool.
Step 16. Graphic design and printing – Develop a professional presentation.

Phase V. Implementation – Ensure proper use by the client.

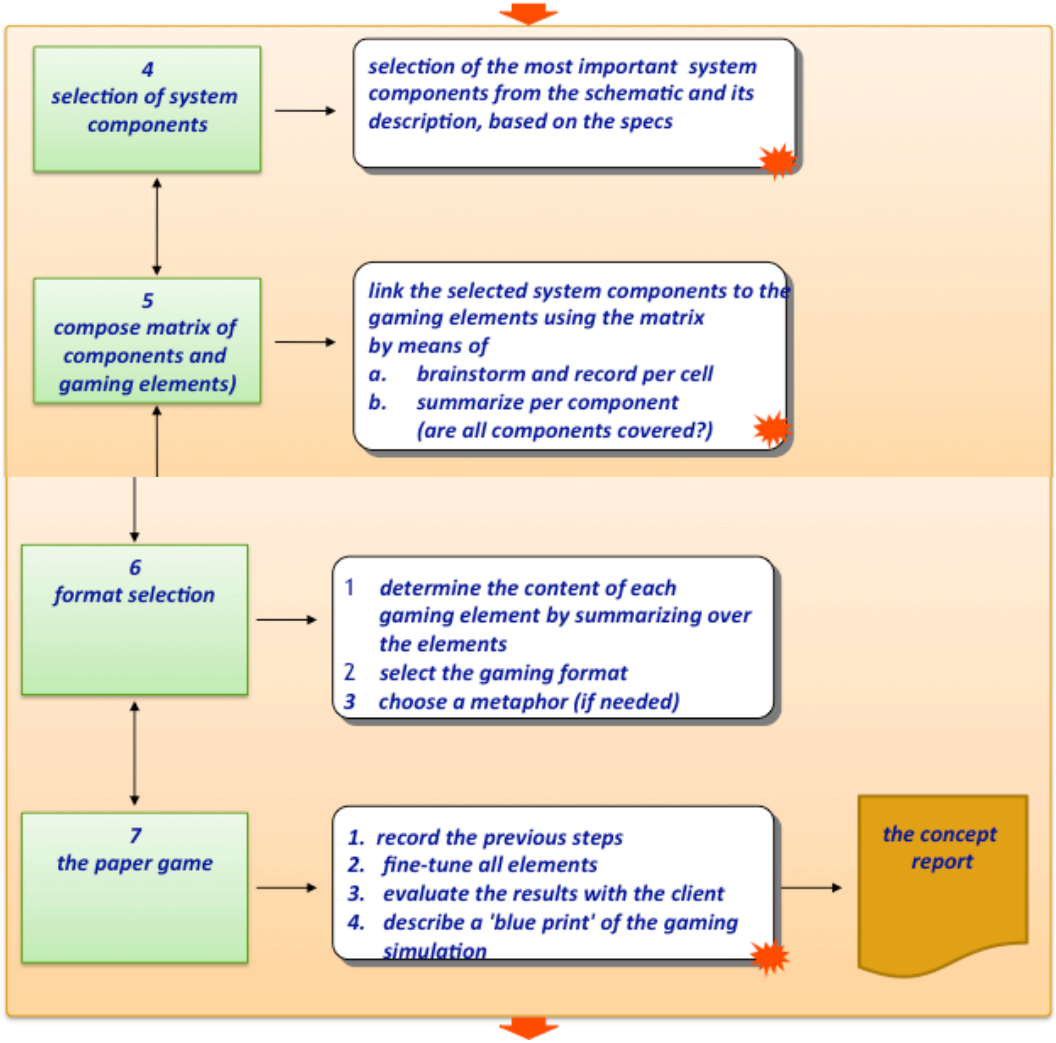
Step 17. Integrate the exercise into the client's environment – Make it fit.
Step 18. Facilitating the exercise – Practical use by the client.
Step 19. Dissemination – Deliver the policy exercise to the client.
Step 20. Ethical and legal concerns – Protect the client and the designers.
Step 21. Final report to the client – Ensure proper closure.

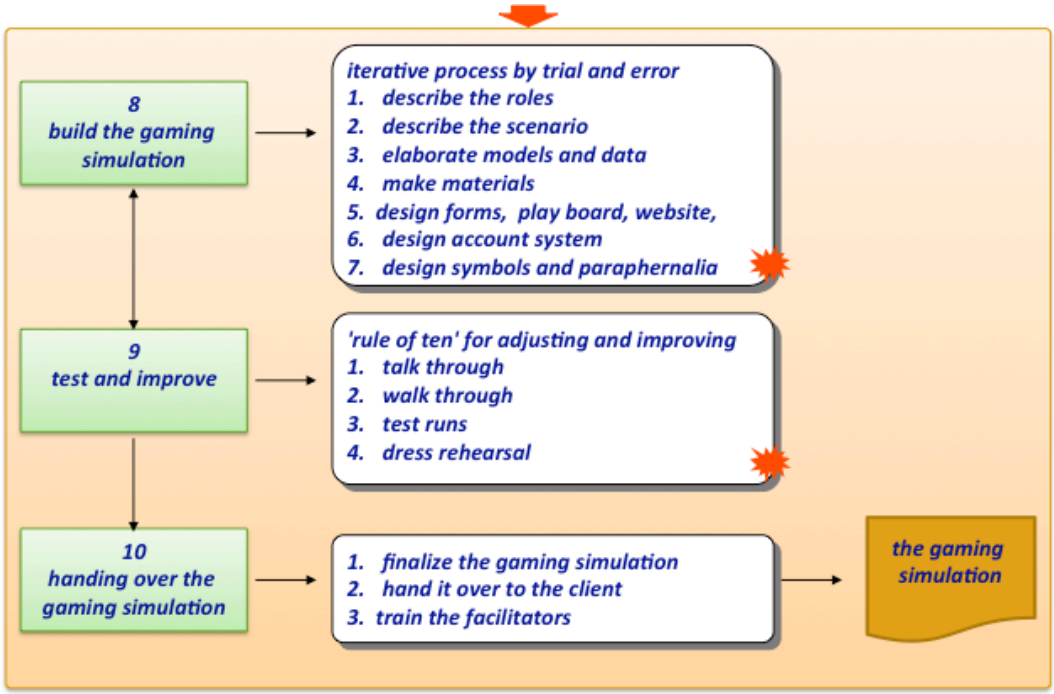
Appendix 2 The design process of simulation games





betekent: controleer met de 'specs' (bij andere fasen ook: met de systeem analyse)


4
selection of system components
selection of the most important system components from the schematic and its description, based on the specs
5
compose matrix of components and gaming elements)
link the selected system components to the gaming elements using the matrix
by means of
a. brainstorm and record per cell
b. summarize per component
(are all components covered?)
6
format selection
1 determine the content of each gaming element by summarizing over the elements
2 select the gaming format
3 choose a metaphor (if needed)
7
the paper game
1. record the previous steps
2. fine-tune all elements
3. evaluate the results with the client
4. describe a 'blue print' of the gaming simulation
the concept report


8
build the gaming simulation
iterative process by trial and error
1. describe the roles
2. describe the scenario
3. elaborate models and data
4. make materials
5. design forms, play board, website,
6. design account system
7. design symbols and paraphernalia
9
test and improve
'rule of ten' for adjusting and improving
1. talk through
2. walk through
3. test runs
4. dress rehearsal
10
handing over the gaming simulation
1. finalize the gaming simulation
2. hand it over to the client
3. train the facilitators
the gaming simulation

Appendix 3 Checklist for the design specifications

1 The background of the problem

1. Why is a simulation game considered as in instrument in this context? What needs, conditions, circumstances, etc. are the occasion for that choice?
2. What is the context of the problem (organizational context, policy context, training context; what are the specific features of that context)?
3. Which themes, issues or problems do occur in this context?
4. On which of these themes, issues and problems the simulation game should focus?
5. What image of reality must be transferred by the simulation game (the current situation, a desired situation, or the transfer from the current to the desired situation)?
6. What is the problem statement, against which the simulation game will be evaluated, once designed and implemented? In other words: in what way should the participants as an individual or as a group change through participation in the simulation game (e.g. knowledge, behavior, attitudes)?
7. Who are the main actors / stakeholders in (relation to) the context of the problem?
8. What are the needs, goals, responsibilities, power, influences, resources, options, etc. of the main actors?
9. Have in an earlier stage other interventions or tools being deployed with regard to the central problem and what were the result of that?

2 Objectives of the simulation game

10. What is the purpose / are the purposes of the simulation game?
    - Transfer information / knowledge
    - Extract information / knowledge from stakeholders
    - Start a dialogue
    - Motivate the participants
    - Create an environment for generating ideas
    - Create awareness
    - Support the decision making process
    - Record behavior and performances
    - Test new behavior or new procedures.

11. Will there be other tools or means being deployed in combination with the simulation game?
12. What are the specific objectives that have to be reached by means of the simulation game? I.e., how should the general problem statement of item 6 made more concrete, and optionally specified for the distinct actors?
13. Against which criteria will the simulation game eventually be evaluated?
    - The correspondence with represented reality
    - An independent assessment by experts from the problem context
    - An independent assessment by experts in game design?
    - The judgment of the participants.

3 The design process

14. Who is within the client organization ultimately responsible for approving the project and for the authorizing of the intermediate products (specifications of design, the system analysis, the game concept and the final product)?
15. Who acts on behalf of the client as a contact person?
16. Which organization members will become member of the design team? What is their anticipated role and expertise within this group?
17. What financial resources are available for designing the simulation game?
18. When should the development and testing of the game simulation be completed?
19. Are there any financial conditions concerning the use of the simulation game (e.g. reproduction costs of the materials)?

4 A General considerations for the design

20. Who are the intended participants for the simulation game?
    - Age, gender, education, social status
    - Professional status, experience, function
    - Homogeneous or heterogeneous groups.
21. What is the size of the group of participants? What are the maximum and the minimum number of participants per game session?
22. What is the main motivation for people to participate in this simulation game?

23. How will the participants be grouped during the simulation game?
    - In teams
    - In coalitions
    - As individuals
    - Does not matter.
24. Looking at the 'tone' of the simulation game, what aspect(s) should have the emphasis?
    - Group dynamic processes
    - Intellectual processes
    - Formulating and transferring 'the system' ('the big picture')
    - Flows and assignment of means
    - Flows and exchange of information
    - Decision-making.
25. In what way will the participants be involved in the simulation game?
    - The emphasis is on an emotional involvement
    - The emphasis is on an intellectual involvement.
26. Are the issues, addressed within the simulation game, predetermined or are the generated by the participants during the simulation game?
27. To what degree will the participants be free to choose their actions?
28. Are there particular analogies or metaphors that should or could be transferred in the simulation game?
29. Are there specific messages, ideas, solutions, that have to be conveyed by means of the simulation game?
    - Is it determined in advance what behavior is ideal/desired?
    - What are any characteristics of that message?
    - Should the transfer of this message happen implicitly or explicitly?
    - Should this message be formulated in a special way or in a special jargon?

30. Is the simulation game to be 'loaded' with a predefined representation of the real life situation?
    - Is this representation to be transferred as the only representation?
    - Should participants be enabled to create their own reality in the simulation game?
31. What level of abstraction is desired? Should the simulation game be a faithful representation of 'reality' or is a more abstract representation thereof possible or desired?
32. What is the desired level of complexity of the symbols?
33. Are there any limitations concerning the time that the simulation game may last? How much time is available for the preparation, execution and debriefing of the simulation game, as well for the participants as for the facilitators?
34. What is the time horizon of the simulation game?
35. What is the desired pace of the simulation game?
36. Are there any themes that are politically or socially sensible, and that have to be taken into consideration during the design phase?
37. Are there any special measures to be considered in relation to the safety and security of (particular groups of) the participants?
38. Will the same group of participants play the simulation game more that once?

5 Elements of the simulation game

39. Is the scenario (fully) predetermined or is it there room for the participants to generate it (partly)?
40. How detailed or abstract should the scenario be?
41. Should the scenario be based on specific documents?
42. Is the sequence of actions sequential or iterative?
43. Is this sequence of actions fixed for the entire simulation game, or have participants the possibility to deviate from it?
44. Is the use of a computer based accounting system
    - Desired of unwanted
    - Necessary or not necessary
    - Practically manageable or not?
45. Is there specific information that should be available, stressed, or kept back during the simulation game?

46. Should the information generated by the participants during the simulation game in one way or the other be stored for later use?
47. Are there special desires concerning the portability, reproducibility and storage of the materials of the simulation game?

6 The use of the simulation game

48. Are there wishes and/or restrictions in relation to the room where the simulation game is to be executed?
49. Are there wishes and/or restrictions in relation to the way the groups of participants will be composed (heterogeneous / homogeneous as regards departments, functions). Should participants be placed in positions similar to the real life situation?
50. Are there wishes and/or restrictions concerning activities immediately preceding the simulation?
51. Are there wishes and/or restrictions concerning activities that immediately follow the simulation game (such as duration, structure)?
52. How will the simulation game be executed?
    - As a stand alone simulation game
    - As a part of a series of activities
    - In combination with a course or in combination with other interventions in a training or change project?
53. Who will be the facilitators of the simulation game?
54. What special skills are required to run the simulation game?
55. How will the facilitators be trained (train the trainer)?
56. Should there be special measures with regard to the debriefing to protect the participants (safety and security)?
57. Who is the owner of the simulation game? Who has the copyright?
58. How and by whom optional improvements will be applied in the simulation game?
59. How and by whom results of the simulation game should be reported?

Colofon

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