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Triadic Game Design

Balancing Reality, Meaning and Play

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Springer

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To the "GameBoys" and "GameGirls"
at Deltares

Preface

To know the road ahead, ask those coming back—Chinese proverb

I remember the day that I received my first game console, an Atari 2600, very well. I was about 6 years old and at that time I could be considered among the happy few to get a first hands-on experience with today's classics as *Frogger*, *Pong*, and *Space Invaders*. The world has changed dramatically since that time. Nowadays masses of people are playing games. They are playing anytime and anywhere thanks to technological advances as the Internet and mobile telephony. They are also playing anything, from playing music in *Guitar Hero* to shooting aliens and other mean looking creatures in *Halo*. Most importantly, the people of today are playing anyhow and anyways. Games have unmistakably become an even more so important part of our culture than what Johan Huizinga once described in his masterpiece "Homo Ludens."

While more and more people are playing games, I suddenly started to barely play anymore. This loss in appetite actually surprised myself, because I never thought I would play less. I remember clearly how much I used to "love" games. After my Atari 2600 I bought almost all game consoles available, from the GameBoy to the first Playstation. My life simply evolved around "games" (and my parents can acknowledge this). At that time, I figured that I would never, but never not play again. Even if I would get married, have children, have a busy job, and so on, I would still play games. I was a bit wrong though.

Because just around finishing secondary school and going to the university I lost my desire to play games. It did not have to do with growing up or women. Simply, when I played a game, I constantly had the feeling that I have "been there, done that." Many games offered the same kind of experience in a different setting, or even worse, the same sort of game with some small improvements. I was done with saving princesses, finding keys to unlock doors, and precisely timing my jumps to get from platform to platform. Games did not keep my attention anymore. I never really stopped playing at all, but I became a "softy." I only played occasionally.

Despite my loss in appetite for games, my youth love did sort of influence my eventual career, because another vivid memory is how much I felt attracted on an open house at a university to these dynamic graphical calculators that were used to

understand complex problems in today's society, such as traffic congestion and air port capacity management. These were what I now consider "hardcore simulation models." With these tools, we can "simulate" what could happen by calculating different outputs based on varying inputs. To me this meant I could "play around" with variables to see how I could defeat the "evil" problem at hand. It almost felt like playing a game, but then one with a meaningful purpose. I was sold and started studying this "Systems Engineering, Policy Analysis, and Management" (SEPAM).

While I was busy passing my exams, certain scholars at the university realized the limitations of these hardcore simulation models. The human element or the "socio-political complexity" is missing from these tools. Decisions are not made rationally and processes, especially if these involve humans, are difficult to capture with algorithms. What is needed is to involve humans into these simulated models. And if we incorporate humans into a simulated environment, let them make decisions, and give them feedback about these decisions, we get a "game." Largely unaware of these developments at the university, I was missing the human element in my study as well. For this reason, I decided to start studying psychology in addition to SEPAM.

At the time some scholars at my university experimented with the use of gaming within the policy domain, others looked into the application of games in completely other domains, from the military to education, and into the positive effects of games in general. So it happened that more and more people started to recognize the potential of gaming and games were being developed for a huge variety of serious purposes, from recruiting personnel, societal critique to advertising brands and goods.

All of these developments were beyond my awareness as well until by mere coincidence I got into touch with the scholars involved with gaming at my university. This made me fall in love with games again. The puzzle pieces seemed to fall into place: my youth admiration of entertainment games, my attraction to hardcore simulation models and my desire to use these to solve societal problems, and my interest in psychology. Since then I have been involved with using games for serious purposes. This book is a result of my involvement so far.

To be clear, the book is not about culture, gender and health issues, violence, generation differences, business models, programming, and graphics. Rather, it is about the *design* of games that are used for serious purposes. This involves thinking of the concept behind those games: the aspects and mechanics that make such games work. Specifically, it lays out the idea of a "design philosophy" called "Triadic Game Design" that may help in thinking about these concepts and may help in eventually designing "good" games with a serious purpose. As the subtitle suggests, creating a "good" game involves balancing the triad of Reality, Meaning, and Play. Each are "worlds" with their own aspects, criteria, people, and disciplines that designers need to take into account.

I conceptualized this philosophy during and after the design of in particularly *Levee Patroller*. This is a game to train inspectors the knowledge and skills of inspecting levees, the barriers that protect a land from flooding. This "journey" gave me the experience and observations to reflect on. In this respect, my journey is

somewhat comparable although by no means of the same scientific significance to Charles Darwin's journey of the Beagle. His journey, which lasted 5 years, took him to several places all over the world to collect specimens, investigate geology, and observe nature. Darwin kept careful notes of his observations and made theoretical speculations throughout. The observations and these initial theoretical speculations were the basis of his groundbreaking evolutionary theory as described in "On the Origin of Species," which was written after almost 30 years (!) of reflection.

In contrast, my journey lasted nine months and in total I reflected almost four years on it. The insights will not change the world like Darwin's insights did, but they can certainly be helpful for those who want to develop or use games with a serious purpose. They make it at least possible "to know the road ahead"...

A number of notes related to the book

1. A movie and a playable demo of *Levee Patroller* can be found on a website that accompanies this book. This website also has information and documents about the workshop based on this philosophy. It further includes links to games that are mentioned throughout this book. See http://triadicgamedesign.com

2. I played most of the games in this book, except for those that I could not buy or download. The screen shots are made by me while playing. For those games that I could or did not play, I requested a screen shot.

3. A standard for citing games has not been established yet. Based on the citation style for movies, computer software, and scholars in the field, I have decided to cite games as follows: "Developer(s). (Year). *Title* [Hardware platform]. Place: Publisher." Games which are very old or of which the origin is unclear, I did not include in the bibliography.

4. The subdivisions of this book consist of "levels" rather than chapters. In Level 1 I will explain why.

Delft, the Netherlands   Casper Harteveld

Acknowledgements

My work is a game, a very serious game—Maurits Cornelis Escher

If writing a book creates many debts, then creating a game *and* writing a book about this process creates many more debts that need to be acknowledged. This turned out to be the case when I started to make the list of people to whom I am grateful. Being overwhelmed by the immensity of the list and the amount of contributions, which is a source of awe and gratitude in itself, I decided to dedicate a separate part of the book to acknowledge all of those that helped me.

To start off with, I want to thank those that made contributions to the progress from manuscript to book. These concern: Hans de Bruijn, Tineke Ruijgh-van der Ploeg, Rafael Bidarra, Harald Warmelink, Sebastiaan Meijer, Rens Kortmann, Arthur van Bilsen, Qiqi Zhou, Alexander Verbraeck, Wim Veen, Ethan Kennerly, Jacco van Uden, Pamela Kato, Yuen Yen Tsai, David Crookall, Ellen Schuurink, and Emanuel Blum. Special mention goes out to my colleague Geertje Bekebrede. Over the years, she has helped me tremendously in getting my thoughts straight.

I would like to have another special mention for my mentor Igor Mayer who taught and made it possible for me to take games more seriously. If I did not run into him as a young and naive student, being unaware of the potential power of games, I may have never been involved with games academically.

For publishing the book, I want to thank the people at Springer, and in particular, Beverley Ford, Helen Desmond, Natasha Harding, and Catherine Moore. Writing your first book is not an easy task. Their encouragement and believe helped me to overcome the obstacles and gain the necessary focus to write something that would be valuable for others to read.

When it comes to the development of the game, I could not have dealt with the world of Reality without working closely with some of the subject-matter experts at Deltares. My thanks go out to Arno Rozing, Cor Zwanenburg, Jan Heemstra, Jan Blinde, Michiel van der Ruyt, and Huub de Bruijn. Similarly, I would like to thank the experts from one of the participating water boards, "Het Hoogheemraadschap van Delfland": Meindert van Dijk, Rob den Dulk, Martijn de Jong, Sandra Junier, Roy Nolten, Rob Nouse, Arie van Schoonhoven, and Jan-Willem Tanis. Each of them enthusiastically played the game and gave me useful feedback for improving it.

I am also thankful for the support and critical observations of the crisis coordinators of all the participating water boards. These are: Margreet Bosker, Eef Janssen, Han Paree, Niels Robbemont, and Kees Rood.

But most of all, I am indebted to the Deltares Game Team. Without them, *Levee Patroller* would not have been such a success. They were able to translate my ideas into a great looking and working product, criticized me when needed, and helped me out when I lost track of things. My story is just as much theirs. It is impossible to thank them enough, so I will stick to a simple "thank you." The following people have been part of the game team (in alphabetical order): Rens van den Bergh (level designer), Arne Bezuijen (modeler), Rui Guimarães (lead programmer), Micheline Hounjet (project manager), Almar Joling (programmer), Jos Maccabiani (project initiator & manager), Raymond van der Meij (project manager), Arjan Peters (programmer), Monique Sanders (content development), Matthijs Schaap (modeler), Sander Smit (modeler), Tom Thé (programmer), Marco Tolman (programmer), Bas Wenneker (programmer), Maarten Wesselius (programmer & interface design), and Maarten van Zomeren (programmer). Of these people, I want to thank Almar, Arne, Matthijs, and Rens additionally for their contributions to this book.

Aside from the game team, I am grateful to Deltares for supporting my "crazy" plans and gaming in general. Not many organizations would allow for such experimentation and innovation, especially when it is not their core business. The game team has now slowly but unmistakenly become part of the organization. Since *Levee Patroller* a number of other games have seen the light and some others are in the pipeline. In addition, I would like to thank the organization for continuing to support me by funding my Ph.D. research, which is about evaluating the use and effectiveness of *Levee Patroller*.

Last but certainly not least, I would like to thank my parents and "little" sister for their endless support. I also want to thank them for reminding me that other things in life are important as well. Being devoted to work let me forget this at times.

The book is a much rewritten, expanded, and elaborated account of my master's thesis as submitted in February 2007 for the partial fulfillment of the requirements for the degree of Master of Science in Systems Engineering, Policy Analysis, and Management at Delft University of Technology. A synopsis of the book was published as "Balancing reality, meaning and play: the design philosophy of Levee Patroller" in *Simulation & Gaming* with the co-authors Rui Guimarães, Igor Mayer, and Rafael Bidarra (in 2010, *41*(3), 316–340).

The book is further the first scientific publication as part of the Games and Learning Alliance (GaLA). GaLA is a Network of Excellence on "serious games" funded by the Eurpean Union in FP7—IST ICT, Technology Enhanced Learning (see http://www.galanoe.eu). GaLA gathers the cutting edge European research and development organizations on "serious games," involving 31 partners from 14 countries. Delft University of Technology is one of the partners.

Contents

Level 1
Press Start

One of the most difficult tasks people can perform, however much others may despise it, is the invention of good games—Carl Gustav Jung

When we try to do something new, we do not know what we are doing. That is the biggest challenge—Jeffrey Kalmikoff

It takes two to tango, but it takes three to design a "meaningful game." For "games with a purpose" to dance, three different worlds need to be balanced: the worlds of Reality, Meaning, and Play. In a nutshell, that is the message of this book. Simultaneously, it is the summary of my experience in designing a "digital game" for training professionals. Both aspects, the theory as well as the practice from which it derived from, are at the core of the following pages.

My journey into the worlds of Reality, Meaning, and Play started in early 2006. Back then I was asked to design a game. The assignment, however, was not to design *any* type of game. They needed a game from which people would actually learn from. At the start of this journey, I was packed with (a) no knowledge or understanding of the subject matter at hand, (b) a basic understanding of the workings of the human brain and how people learn, and (c) little knowledge of games beyond playing them. Consequently, I found myself in quite some "challenging" position. Especially, since the "client" also had no experience with these types of projects at all.

I did not give up. Instead, I consulted experts with various backgrounds, read many books and articles, rooted in psychology to game design, and critically analyzed (and played) several games, from entertainment to serious ones. Looking back I can conclude that the experience was sometimes frustrating and sometimes a bit boring. On occasions, it took many hours, days, or even weeks before I figured out how to deal with a design dilemma. At other times, I was busy translating design documents, writing help files, and doing other activities that are not the most fun imaginable (for me at least). Nevertheless, the project kept me going: I was in a "flow."

Part of what kept me going pertains to the "instant feedback." Every deliberation resulted a few moments later in an addition or modification of an actual product. Creating a game is hard work. To see ideas develop and come alive is, therefore, extra rewarding. This is similar to the rewarding feeling of defeating an end-boss or retrieving a special item in a game. Playing games—although it is commonly seen as a trivial activity—is hard work too. But to keep on seeing improvements or, in game-specific terms, "to go to the next level," it is often not sufficient to simply use a "trial-and-error" method. Critical "reflections" are necessary to achieve this: what works and what does not?

Throughout and after the journey I have made these sorts of critical reflections as well to understand what it means to design games that are applied for serious purposes. These reflections are written down in this book. This makes what I am about to tell very personal, yet the message of this book, the balancing of three different worlds, goes very much beyond my original assignment to come up with an educational game. The idea of *Triadic Game Design* (TGD), as set out in this book, can be applied to any type of game. In this first level, I will give a glimpse of what this design philosophy is all about. But before I really get to this, I have to provide some necessary background information.

The Background Story

In games a so-called "background story" is given, either textually but nowadays mostly audio-visually, that introduces the game elements and the goal of the game. Quite often this story is irrelevant or uninspiring. It is stereotypically about saving princesses or defeating evil monsters that are terrorizing planet earth. For this reason, many players mostly skip this after they pressed start to play a game. I, however, recommend not to skip this background story, because unlike in most games this information is critically important. This information is necessary to understand where the idea of TGD comes from and how it fits into the larger picture of what goes around in the world of games.

Digital Versus Analog

First of all, about what kind of "objects" am I talking? Obviously games, but these artifacts are quite versatile. They can range from a game of *Chess* to the "Massively Multiplayer Online Role Playing Game" (MMORPG) *World of Warcraft*. To be clear, this book is about *digital games*. I prefer this term over "computer games" and "videogames," as these terms refer in a strict sense to either PC-based games or console games (i.e., games played on Playstation, Xbox, or Wii), respectively. The term "digital" includes all games with a computerized backbone. Additionally, it is the perfect antithesis of analog.

Nevertheless, the distinction between digital and analog is not clear-cut. Many analog games are computer-supported. They use spreadsheets or "simulations" that calculate the input from players and give them feedback about this input. Also, many of them are digitalized. We can play *Chess*, for instance, on a computer. On the other hand, digital games can be "analog-supported." During and in between playing a game, players can use real maps or have "real life" meetings with each other. The distinction is thus more of a continuum of the intensity and extent in which is made use of computer technology rather than one in which it is either/or.

The "intense" use of computer technology can make a difference. Juul (2005) explains that (a) due to the possibility to automate procedures, digital games allow for more complex rules and more detailed fictional worlds, (b) when a digital game is played, a focus is placed initially on the appearance of the game as a fictional world rather than a set of rules to manipulate fictional elements, and (c) because digital games are immaterial, they can depict fictional worlds more easily than analog games.

Therefore, the affordances of computer technology allow for different types of games, more complex, detailed, audio-visual, and so on, and this makes designing such games "slightly" different. Slightly, because the same principles of design can be applied to all sorts of games, from card, party, and gambling games to digital games and virtual worlds (Schell 2008). For this reason, while I focus on digital games, the insights offered can be applied to analog, computer-supported, or analog-supported games as well. They may even help in designing a "meaningful" party or gambling game.

Meaning of Meaningfulness

I mentioned "meaningful games," but all games can be perceived as meaningful to some extend (Jones 2008). Additionally, games can have a profound effect on the society at large in, for instance, our attitudes and ways of thinking and working according to Beck and Wade (2004), Herz (1997), Prensky (2001), Tapscott (1997), Veen and Vrakking (2006) and many others. They more or less argue that the generations that are growing up digitally, who—amongst many other names—are referred to as the Net Generation, the Digital Natives, the Homo Zappiens, or simply the Game Generation, will fundamentally change (or demand) the way we work. Whether this will happen and to what extend remains to be seen.

Nonetheless, the facts that show that more and more people—and not only children and teenagers (cf., Yee 2006)—play games and do so anywhere and anytime, from playing a game on a cell phone during a subway ride to spending a stolen moment at the office by playing *Solitaire*, bring to mind that games have become more deeply embedded in the fabric of our everyday lives. As with everything, this will not come about without any consequences for our society as a whole. This means that the phenomenon of games as seen from a macro-perspective or from a sociological perspective are quite meaningful. They have an impact on our society.

The meaningfulness of games can also be looked at from a different angle: from a micro (or psychological) rather then macro-perspective. Numerous authors have argued that people learn from playing games (Gee 2004; Johnson 2005; Prensky 2001). For example, it has been found that players can improve their visual, motor skills (Achtman et al. 2008; Green and Bavelier 2003; Feng et al. 2007), and leadership skills (Yee 2006), or increase their knowledge about history (Egenfeldt-Nielsen 2007), civilizations (Squire 2004), and urban planning (Adams 1998; Gaber 2007). It also has been found that this learning is useful in practice, as surgeons who play games perform better during actual surgery (Rosser et al. 2007). This makes playing games meaningful beyond the game itself.

Although some proof exists, it can always be questioned whether this learning is useful *outside* the game environment, while *inside* the game environment learning is simply *necessary*.[1] Games are intrinsically "learning environments." Most games start with offering relatively easy and simple challenges and become more difficult along the way (Juul 2005; Koster 2005). To proceed, players have to get the necessary knowledge and skills of how to play the game. They are learning.

Therefore, when players indicate after defeating an enemy that they "beat it," they are actually saying that they "learned how to defeat the enemy." But to be able to do this, the environment itself, the game, needs to be meaningful. Players need to understand that they are required to defeat the enemy to proceed and they need to know how to do this. If the game does not allow for any of such understanding, it becomes incomprehensible and, therefore, unplayable. This means that in fact *any* game *must* be meaningful to be played at all.

While a game must be meaningful in itself, when I refer to "meaningfulness," I actually mean any meaning beyond the game. In other words, a meaningful game is one which has an impact on real world activities. Such a game may or may not have been designed with this "purpose" in mind.

Games with a Purpose

I also mentioned "games with a purpose." Of course, any game (or even any artifact) is designed with a certain kind of purpose in mind, financially for sure, and artistically probably as well. What is mostly meant by a game with a purpose, however, is that they have a non-entertainment purpose (Sawyer 2002). Such purposes can range from building a game to make people aware about the conditions in development countries (see *Ayiti: The Cost of Life*), to recruiting people for a job (see *America's Army*), to even improving search engines (see *The ESP Game*). Tons of other examples are available for various domains (Bergeron 2006; Michael and Chen 2006). When it comes to applications, the sky really seems the limit.

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[1]People even have to learn how to play games in general similar as to being able to read books. This requires quite some knowledge and skills and has been labeled as "video game literacy" (Gee 2004).

To make things even a bit confusing, while lots of games have been made with an entertainment purpose in mind, they are sometimes used for serious purposes (Van Eck 2009). Games like *Civilization* and *SimCity*, which are employed in classrooms to teach about history and urban planning, respectively, immediately come to mind. More intriguing concerns the use of games as a "social lubricant" for supporting communal activities, in, for example, libraries (Adams 2007). An entertainment game such as *Guitar Hero*, which is sort of a game-like karaoke with fake instruments, can, for instance, be used to bring people together and to get know each other. This gives the impression that it is about the *activity* rather than the artifacts themselves.

Activity or artifact, both need to be designed. With "designed" I mean that the initiators have *consciously* thought of how to develop, modify, or use a game within a certain setting to achieve a specific purpose that extends beyond the game itself. It needs to be thought of how *Ayiti: The Cost of Life* raises awareness, how *Civilization* can be used in the classroom, how *Guitar Hero* could serve as a social lubricant, and so forth. For games with a purpose, the game or the activity involving a game needs to be designed to bring forth value to an individual (e.g., training or education), a group or organization (e.g., collaboration or forecasting scenarios), or a system (e.g., political structures or databases).

To distinguish "a purpose" from the achievement of these real world values, I will continue to speak of "games with a serious purpose." It further *depends* on the specific "serious purpose" if designers are able to use existing (entertainment) games or have to design complete new ones. This brings me to the next notion.

COTS or Not?

I have to stress that when taking existing games—or "Commercial-Off-The-Shelf" (COTS) games as they are referred to—one needs to be careful.[2] Although many entertainment games, like for example *Civilization* or *Sim City*, correspond to meaningful topics, their designers created them with the goal of developing first of all a fun game about a serious topic.

As such, the connection of these games to reality is lost or at least arbitrary (Shaffer 2006). They can still be useful for learning to think about certain aspects in reality as some studies have shown (Adams 1998; Squire 2004). However, because the aspects are not appropriately embedded, it would be difficult for an effective "transfer" from a game to reality to occur. For this to happen, the game should have been built around teaching players to think in a way to solve problems in reality, not in the game. Shaffer explains why this is needed:

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[2]In the world of analog games, the term COTS has a different meaning. COTS are games that can be applied to many situations, while "tailor-made" games are specifically developed for one type of situation (Duke and Geurts 2004).

> ...the focus of a game matters in the end, and in the most extreme cases, commercial games
> can give dangerously inaccurate portrayals of the way things work in the real world. (p. 177)

Of course, when designing a complete new game, designers run the risk of creating a "dangerously inaccurate portrayal" as well. But the initial intention of those designers and the resulting process of designing the game are aimed at preventing this from happening. In the end, this can make a significant difference.

Despite this warning, it still comes down to the following two words: "it depends." Sometimes it is not necessary to be accurate. Sometimes it is not about the content, but about the activity. Sometimes an existing game just perfectly fits the specific serious purpose people have in mind. The important thing is to be able to make these considerations and judge what to do. For this, TGD may offer a way of thinking and a framework to hold onto.

Babel Problem

Generally, people need a label for everything. This makes life practical. It is much more useful to say "hand me the salt" than "hand me that thing." This requires not only that "things" are labeled, but that others also understand those labels. A shared understanding or agreement about terms and definitions is necessary. If a person does not know what precisely "salt" is, he or she may just as well hand over the pepper.

Aside from accurately naming "things," the problem lies exactly in this agreement about labels. People from different communities and cultures may label differently and this may cause some to not understand the meaning of a label anymore. And if we are thinking about a "Babel problem" or a "rant on terms and definitions," this is exactly what has been happening in the area of games with a serious purpose. Aldrich (2009) mentions a list of terms that are used. Besides naming them "games," he encountered the terms virtual experiences, simulations, social impact games, practiceware, game-based learning, immersive learning environments, educational simulations, serious games, and sims. I want to add to this: epistemic games, edutainment, edugaming, simulation/gaming, simulators, persuasive games, virtual training environments, and so on. The list is endless.

Of this endless list, the two foremost candidates for agreement are "simulations" and "serious games," because these are by far the most widely used and are not specifically restricted to a certain domain. Although the first, simulations, clearly indicates that the artifact needs to have a connection with the world of Reality, I dislike the term for its clear connotation as well with what I call "hardcore simulations." These are dynamic graphical calculators that assist decision makers in solving complex problems. They require no participation of human beings, except for providing some input at the beginning of the calculation process. Additionally, the term *is* a game genre. It is a type of game.

The second, serious games, nicely indicates that we are talking about games and those that are very serious indeed. However, the term is an oxymoron. How can

something be both serious and a game? The two seem mutually exclusive. And does this mean that entertainment games are not serious? If players spend over 20 hours on their games, we would assume they would take their games very serious. For these and other reasons (cf., Bogost 2007; Klabbers 2009), not everybody agrees on using this term, although it is by far the best common denominator to let others understand about what we are talking.

What to do with this war over terms with no clear winner? For this, we may find an answer by going back to the label "salt." We can use salt *for* various purposes. Generally, we use it for cooking and food. But we can also use it for getting rid of red wine stains from clothes or for drinking cocktails, like tequila. While it has several purposes, we do not call the first "food salt," the second "stain salt," and the third "cocktail salt." We just call it salt and describe for what we are going to use it. That is what people tend to do in life. If there is not an appropriate term, at least one with which there is not an agreement on, we simply describe what we mean.

Translating this to our problem here, it means that we should talk about games and explicitly state with what purpose we use it. In specific cases, we could still shorten it to, for example advergames, educational games, training games, or exergames, but when we generally speak about games that need to achieve something beyond the game itself, we would need to stick to either "games with a serious purpose," "games with an non-entertainment purpose," or "games with a meaningful purpose." I know this is quite cumbersome and for that reason, whenever I talk about "games" I refer to these types of games. Whenever I need to make a distinction between these games and entertainment games, I will specifically mention this in the text by fully describing—as I just did—the specific purpose.

A History Pop-Up Screen

In games, pop-up screens may appear with additional information about the game after the background story has been told. Before we get to TGD, I have to do this as well, because the idea of using games for serious purposes has unlike what many tend to believe deep historical roots. Over the years (and even centuries) it has appeared in many shapes and forms. It is valuable to be aware of this. History teaches us a lot. It also enables us as Isaac Newton put it so modestly to "stand on the shoulders of giants," and therefore, build upon the knowledge and experiences that are already out there. For this reason, I want to shortly sketch the history of this quickly expanding field. This sketch is by no means all-conclusive. Let us start from the mere beginning when we just began to walk on our feet.

Precivilized Times

Once upon a time we humans came into existence. We do not have any specific evidence of the significance of games in those times, but if we have to belief

Huizinga (1938/1955) play or playfulness has had a significant function to human development from the moment we began to walk on our feet. He writes for instance:

> Play is older than culture, for culture, however inadequately defined, always presupposes human society, and animals have not waited for man to teach them their playing. We can safely assert, even, that human civilization has added no essential feature to the general idea of play. Animals play just like men. We have only to watch young dogs to see that all the essentials of human play are present in their merry gambols. They invite one another to play by a certain ceremoniousness of attitude and gesture. They keep to the rule that you shall not bite, or not bite hard, your brother's ear. They pretend to get terribly angry. And—what is most important—in all these doings they plainly experience tremendous fun and enjoyment. (p. 1)

In his book "Homo Ludens"—the playful human being—he elaborates how play has contributed to sacred institutions, such as rituals and ceremonies, as well as to law, war, poetry, philosophy, and the art. According to Huizinga (1938/1955), the contribution of play is particularly evident in the earlier phases of human civilization. As he puts it, "the more highly organized forms of society, religion, science, law, war and politics gradually lose touch with play" (p. 119). Only in poetics and especially music playfulness is still very recognizable (see also Nachmanovitch 1991).

Formally, playful activities (including games) stand quite consciously outside "ordinary" life. They take place in a "magic circle," a temporary secluded place from reality where a random child can be a doctor or a pilot for a day, and he calls them, therefore, "not serious." Contrary to this, throughout his book he shows and also clearly states that "play can very well include seriousness" (p. 45). This seems a paradox, but it is just an apparent one. In Huizinga's words: "In play there is something 'at play' which transcends the immediate needs of life and imparts meaning to the action. All play means something" (p. 1). While many scholars take Huizinga's work as a point of departure for showing that play cannot be serious, his whole book tries to show that this "not serious" play matters and to such a degree that it has helped to establish something very serious: a civilization.

From this, we can retrieve that from the beginning of times humans (and also animals) have been "playing" and with benefits beyond the enjoyable experience itself. Let us now take a look at the civilized times, the times in which we could find some clear evidence of the use of games.

Civilized Times

During the civilized times evidence suggest that the first actual games were being used. The Egyptian board game *S'n't*, later known as *Senet* or *Senat*, is claimed to be the oldest.[3] It was found in the 2686 BC tomb of Hesy-re and can be seen as a

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[3]Besides *Senet*, *The Royal Game of Ur* and the African stone game *Mancala* are frequently mentioned as one of the oldest games (Parlett 1999). Of the first, four complete sets were discovered

precursor of contemporary *Backgammon* and *Parcheesi*. A number of First Dynasty (3100 BC) *Senet* board hieroglyphs indicate that the game may even be older (Piccione 1980). The game was originally strictly a pastime, but it gradually—as the Egyptian religion evolved—transformed into a simulation of the netherworld, with its squares depicting major divinities and events in the afterlife. Even back then "entertainment" games were repurposed for serious causes.

Another interesting old game concerns *Go*. This game is considered to be the oldest "unchanged" game that is still played up to today.[4] Its origin is disputed, because unlike *Senet* its oldest claim traces back to a legend (Fairbairn 1995). This legend holds that the Chinese emperor Yao (2337–2258 BC) designed it to improve the intelligence of his dull-witted son Dan Zhu. The "serious purpose" attributed to the game stands in stark contrast to one of the oldest references found. It is a remark made by Confucius in his "Analects of Confucius," a compilation of his work by his disciples some time after his death in 479 BC. He asserts that playing *Go* is just one step ahead from gluttony and idleness.

Aside from this familiar comment in the light of the discussions about games today, other claims of origin are quite serious as well. Some say that *Go* may have originally served as a forerunner to the abacus. Others think it may have been a fortune-telling device, with black and white stones representing Yin and Yang. Finally, a number of theories suggest that the game was derived from Chinese tribal warlords and generals, who used pieces of stone to map out attacking positions (Masayoshi 2005). As for the latter, insofar the speculation is justified, *Go* has certainly less strong associations with warfare in comparison to another ancient game: *Chess*.

Chess is conceived to originate from India in the 6th century. From there, it spread to, for instance, Europe, where it was modified around 1475 to the version as it is essentially known today (Hooper and Whyld 1992). Its affiliations with warfare are manifest with a board consisting of two opposing armies composed of rooks, knights, and kings. In the Middle Ages and during the Renaissance the game was part of the noble culture. It was used to teach war strategy and was looked upon as a "gentleman's game" (Vale 2001). Similar to *Senet*, *Chess* was also often used as a basis of sermons on morality (Olmert 1996). Criticism about the usefulness of the game can also be heard from that time, for example by Castiglione (1528/1997):

> . . . for who ever will be excellent in the playe of chestes, I beleave he must beestowe much tyme about it, and applie it with so much study, that a man may assoone learne some noble

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in 1926–1927 by Sir Leonard Woolley in royal tombs in what is now Iraq that date back to more than 2500 BC. This suggests that the game could be 6000 years old. As for the latter, paleontologist Richard Leakey found some boards in Kenya that he dates to Neolithic times. Why *Senet* is nevertheless considered the oldest is probably based on the overwhelming amount of evidence that it was played back in those days (Piccione 1980). It may also be that non-board games, such as games of dice, are even older. These games are, however, less well documented. This is thus mere speculation.

[4] Nowadays modern versions of *Senet* can be played. However, unlike *Go* which has never ceased to be played, these versions have been reconstructed based on extensive research. No one knows the actual rules, because instructions have never been found.

scyence, or compase any other matter of importaunce, and yet in the ende in beestowing all
that laboure, he knoweth no more but a game. (pp. 27–28)

The quote is an early instance of critiquing the "validity" and the "effectiveness"
of a game. It basically questions whether people will actually learn something use-
ful from *Chess* beyond the game itself and whether it would not have been better to
invest in something else. The later Benjamin Franklin (1779) thinks otherwise. He
asserts that there is a lot to learn from the game "for Life is a kind of *Chess*." He
claims that by playing we may learn certain qualities, like foresight, circumspec-
tion, and caution. Although *Chess* is still promoted as educational or intellectually
challenging, the representational meaning has become completely lost for today's
players. According to Parlett (1999) this is true for many games:

> We think of *Chess* as abstract because, although we are aware of its origins as a war game,
> we no longer think of the pieces as elements of a medieval army when we actually play it
> …[while] *Chess*, to its inventors and earliest players, was as representational as our rela-
> tively modern game of *Monopoly*—more so, in that they regarded it as being of educational
> value in the basics of warfare. Nearly all the traditional games we now regard as abstract
> were in their day considered representational, or at least symbolic. The simplest process of
> moving pebbles round a circuit of holes in accordance with the throw of dice was universally
> perceived as representing a real-life race, while the precursor of *Snakes & Ladders* was a
> game of moral instruction. Conversely, when playing *Monopoly*, we forget the deficiencies
> of its representational aspirations—the ancient scale of values, the simplistic purchase of
> public utilities, the irrelevance of enjoying birthdays and winning second prize in a beauty
> contest—and slip automatically into the habit of thinking of moves and transactions in ab-
> stract terms. (p. 6, italics added)

Many of the games in civilized times were very meaningful to the people in
those times. Some may have considered it as a pastime, but others certainly ascribed
more value to games. It is hard for us to perceive this, because while the rules have
remained, the meaning has disappeared as games are apparently extremely cultural-
historically sensitive and dependent. When we now play one of these games we just
manipulate the rules, while a couple of centuries ago these were actually seen as
games with a meaningful purpose.[5] Let us now jump to the modern times and see
what gaming has brought us in the 20th Century.

Modern Times

Early 20th century, in 1910 to be precise, an interesting board game called *Pank-
a-Squith* appeared (Fig. 1.1).[6] The game took its name from political opponents

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[5]Another way of looking at it, is to use Baudrillard's (1981/1994) concept of simulacra. These
are copies without a clear reference to the original. This may mean that due to the many copies
over time, the reference to the original intentions of these games disappeared, and hence their
representational meaning.

[6]*Pank-a-Squith* was part of the exhibition "Pastimes and Paradigms: Games we Play" by the
Division of Rare and Manuscript Collections of Cornell University in 2004. Among the col-

Fig. 1.1 Striving for woman's suffrage in *Pank-a-Squith*. The illustrations show the difficulties encountered by supporters in the suffragette movement. Image provided by Division of Rare and Manuscript Collections of Cornell University

in Edwardian England—the suffragette leader Emmeline Pankhurst (1858–1928) and Herbert Asquith (1852–1928), Prime Minister from 1908 to 1916. Much similar to *Game of the Goose*, the goal of the game is to go from the starting point, where a woman is taking care of her children and her home, and reach the ending point, the House of Parliament, the pinnacle of achievement for the campaign for woman's suffrage. The latter is represented by the picture in the center of the board. In between these two points, illustrations show the difficulties the supporters of the suffragette movement encountered, like police officers who say "How brave I am fighting women," and give an idea of the position of women at the time, as for instance shown in a picture in which a tax collector says "What we do with your money that is no affair of yours madam." From this we see that already at that time, games were being used as rhetorical devices.

Despite some exceptions, like *Pank-a-Squith*, the larger emphasis of using games in the early 20th century was on what is referred to as "war gaming" (Brewer and Shubik 1979; Shubik 1975). While the connection between games and war has been historically laid by for instance *Chess* and *Go*, its extensive use can also be explained logically. The reason to create and use games about war is that people need to be prepared to engage in combat. This preparation can be physical, tactical, or even strategic. It is deemed necessary as it can give a considerable advantage over competitors when a real war arrives and war, as we know, has enormous consequences, so one would like to be prepared for something like this.

lection of this exhibition were games that deliver political messages, promote (moral) principles, preserve identity, and are used for education. This collection can be visited online at http://rmc.library.cornell.edu/games/.

Although war gaming really took a flight in the first half of the 20th century, its inception is said to be in 1824, when Lieutenant Von Reisswitz modified his father's work on sand table-top games and produced a map game at a scale of around 8 inches to the mile that was suitable for military training (Brewer and Shubik 1979; Shubik 2009). On viewing the game, Von Meuffling, Chief of Staff of the Prussian Army, commented:

> It is not a game at all. It is a training for war; I shall recommend it most emphatically to the whole army. (as cited in Shubik 2009)

Whether they perceived it as a game or not, gaming has taken an important place in the military. The extent to which gaming is taking serious and the large scale of it can be seen with the "Millennium Challenge," reputedly the most expensive war game exercise ever conducted (Gladwell 2005). The game was used to test modern warfare methods and involved both computer simulations and real-world exercises. To test this, one team, the Red team, represented an unnamed Middle Eastern rogue state and only had the old means of warfare available. They were commanded by retired Marine Lt. General Paul Van Riper. The other team, the Blue team, was able to use the new modern warfare methods.

In the first few days of the exercise, Van Riper kept numerous computer-generated boats and planes, many of them civilian, around the virtual Persian Gulf. As the US fleet entered the Gulf, Van Riper gave a signal which could not be intercepted as it was a coded message broadcast from the minarets of mosques at the call to prayer. The pleasure crafts and planes changed into deadly suicide weaponry that destroyed sixteen ships, along with thousands of marines. By using surprise and unorthodox tactics, Van Riper sank most of the US expeditionary fleet in the Persian Gulf, and in fact won the game. If this would really happened, it would have been the worst naval disaster since Pearl Harbor.

Although it was set up as an objective experiment, the facilitators, faced with an abrupt and embarrassing end to the most expensive and sophisticated military exercise in the US history, pretended the whole thing had not happened. They brought the dead troops back to life and "refloated" the sunken fleet. They further scripted the game to ensure a Blue team victory. They were essentially "cheating." Van Riper got so fed up and refused to play anymore:

> I am angered that, in a sense, 250 million was wasted. But I am even more angry that an idea that has never been truly validated, that never really went through the crucible of a real experiment, is being exported to our operational forces to use. What I saw in this particular exercise and the results from it were very similar to what I saw as a young second lieutenant back in the 1960s...The computers in Saigon said we were winning the war, while out there in the rice paddies we knew damn well we were not winning the war. That is where we went astray, and I see these new concepts potentially being equally as ill-informed and equally dangerous. From an interview with Van Riper by Willis (2003)

Although the Millennium Challenge 2002 has been poorly executed, it does show the potential power and the possibilities of gaming, and its importance for the military. It further reminds us of what makes games different from computer models and simulations: the input of human beings including their ability to use surprise

and creativity which creates for unexpected outcomes. Such input is incredibly important, because as Van Riper asserts, computers themselves can led us astray.

In this century gaming did not remain exclusive to the military. In fact, according to Mayer (2009), if we accept the Von Clausewitz (1832/1873) theorem that "war is a continuation of policy by other means," war gaming can be seen as one of earliest forms of what he calls "policy gaming." The transfer from war gaming to other forms of policy gaming was a step-by-step process of trial-and-error and institutional learning. Mayer observes that just after World War II a rationalization process culminated in the field of policy making which became later known as the "decision sciences." In the vein of this movement policy makers tried to "optimize" the complex problems they faced with tools, which range from formal modeling to hardcore simulations.

Similar to Van Riper's conclusions, in the 60s and 70s scholars encountered the limitations of the formalization and use of computer simulations to solve these complex policy problems (Mayer 2009). Public policy making is not neat and rational but chaotic and messy and to account for this a move was needed to more human-centered approaches which were also responsive to the socio-political complexity. A number of less formal and more interactive methods were investigated and among these concerned the use of gaming. With games the "political actors," the participants of a policy process, be it governments or companies, could be included into the process and by means of a "multilogue," the simultaneous dialogue between multiple actors, a greater understanding could be achieved of each other and the topic at hand (Duke 1974; Duke and Geurts 2004).[7]

One of the better known policy games concerns *Hexagon* (or *Hex*), which was originally developed by Dick Duke for UNESCO in 1975 as a tool for governments in developing countries to learn how to allocate resources (Fig. 1.2). In this game, participants are challenged to take on the role of national, regional, or local leaders of a developing country plagued by structural shortcomings. Their task is to ensure the well-being of their population and they can achieve this by allocating resources, like cash, food, housing, infrastructure, efficiently among and between different groups. This requires communication within groups and between different organizational levels. And if this was not already difficult enough, external events, like a huge disaster, can happen.

Parallel to the developments in policy making, the use of games emerged in the business and management sciences and contexts, although in this domain the usage has remained primarily for educational purposes. In fact, similar to policy gaming, gaming transferred from war gaming to what is now known as "business gaming" (Faria et al. 2009). This can be dated back to 1932, when Mary Birshtein who while

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[7]Mayer (2009) further argues that the use of gaming is most fruitful when a simulation model is used in interaction with real participants. If only the model is used, it neglects the social-political context. Humans are reduced to factors. If only the participants play a role, it can easily degenerate "into a rather one-sided, superficial venting of desires and viewpoints" or it may lead to "negotiated non-sense": a political compromise or consensus that is not supported by scientific evidence or can even be in conflict with the physical-technical complexity. To prevent this, a "reality-check" is needed and a hardcore simulation model can provide this.

Fig. 1.2 The game *Hexagon* by Dick Duke. The upper platform symbolizes the national level of the developing country, the middle platform the regional level, and the lower platform the local level. Picture by Pieter van der Hijden

teaching at the Leningrad Institute got the idea to adapt the concept of war games to the business environment. She realized that similar to recreating or experimenting with war scenarios, games make it possible to emulate features and characteristics of an organization's routine, so participants can exercise the skills that will be required in the real organization without exposing these real organizations to any direct risks. Her first business game simulated the assembly process at a typewriter factory and was used to train managers on how to handle production problems. From that moment on Mary developed more than 40 similar games with her team until the World War II broke out and interrupted her work (see also Dzhukov et al. 1993).

Similar to policy gaming as well, in the 60s and 70s the use of games took a flight (Faria et al. 2009). In 1962, a survey of 107 business schools reported that 71.1% used business games (Dale and Klasson 1962). Additionally, in 1980, 228 business games were reported to be in use (Horn and Cleaves 1980). The popularity of business games can be subscribed to the close fit with the world of businesses and games: decision making, team work, thinking of strategies, and being able to learn from mistakes while being confronted in a highly competitive and dynamic world requires certain skills, cognitive as well as social, and games are able to provide the sort of settings in which such worlds can be enacted and in which the desired competencies can be learned. Nowadays, the use of business games is quite common at schools. But a lot more has happened as well, so let us now take a look at the developments in our contemporary society.

Contemporary Society

From the 20th century we can see that gaming was already applied in a variety of domains, in politics, military, policy, and business, and used for a variety of purposes, persuasion, assessment of strategies and equipment, exploration of policies, and education. In our contemporary society the use of gaming has certainly extended to a huge number of other domains, from health to advertising, and to a larger variety

Fig. 1.3 Typing words before they get electrocuted in *Tempo Typen*. The word "diepvries" moves to the left and needs to be typed otherwise it gets electrocuted and the player loses energy. The blue bar indicates the amount of energy left. ©1984 Radarsoft. Used with permission
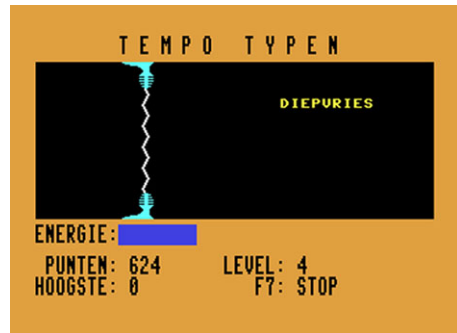
of purposes, from data collection to attitude change. The most important difference concerns, however, the paradigm shift from "using the computer" to "playing on the computer." In the early 20th century, the computer was used to *support* the game. In contrast, with "digital games," the computer is at the center of what is being played.

Despite that the use of "digital games" has really taken off since the early 90s, the idea of it was incepted precisely around the time that analog games became popular with policy analysts and business schools. Various claims and debates are still taking place about what exactly the first digital game is, but it remains a fact that in between 1947 and 1972, several attempts have been done to create something like a "digital game." In 1972 *Pong* was released and from that moment on many other digital games followed. With the introduction of the PC and several "game consoles," a computer specifically dedicated to playing games on, the digital games market grew out to one of the biggest entertainment industries, if not the biggest by now.

It actually did not take long before some developers started to think of how to utilize these types of games for serious purposes. For example, I found a game from a Dutch company called Radarsoft who created a game in 1984 to learn how to type (Fig. 1.3). This game, called *Tempo Typen* (which can be translated to "Rapid Typing"), requires a player to type the words that appear in the screen and which move from right to left. If the player does not type the words in time, the words are electrocuted and the player loses energy. When the "energybar" is depleted, it is game over. When a player does well, after every level the "electrocuting device" moves to the right so it takes less time before words hit it. This makes the game increasingly harder as the player progresses.

Along with *Tempo Typen* many other educational games were being developed. The sole alibi for the development of these games back then over other educational software was the engaging power of games, the ability to keep players connected to the game for hours (Egenfeldt-Nielsen 2007), which was shown by Malone (1981). Although some interesting games were being developed, such as *Rocky Boots*, in which players have to design simple digital logic circuits, *The Oregon Trail*, in which players follow the footsteps of early American settlers and learn about the American pioneer spirit, and Chris Crawford's *Balance of the Planet* and *Balance of Power*, in which players learn about environmental and international relations problems, respectively, the educational games that dominated the scene in the 80s and