

## Level 2

# Foundations

*He who has not first laid his foundations may be able with great ability to lay them afterwards, but they will be laid with trouble to the architect and danger to the building—Niccolo Machiavelli*

*An imitation of an action must represent one action, a complete whole, with its several incidents so closely connected that the transposal or withdrawal of any one of them will disjoin and dislocate the whole. For that which makes no perceptible difference by its presence or absence is no real part of the whole—Aristotle*

In a very simple “game” called *September 12th* an anonymous Middle Eastern town is depicted with civilians, dogs, and terrorists (Fig. 2.1).<sup>1</sup> In the game the player controls a crosshair which can be moved around freely. Clicking the mouse button fires a missile which after a short delay destroys everything in the near vicinity of where it hits. The game does not provide any instructions of how to play it, but given the tool—the ability to shoot missiles—it seems rather logical to kill the terrorists. When I played it the first time, after observing the town for a while, I simply started to shoot the terrorists.

There is, however, a catch to it. When civilians are killed, others gather around and weep, and become terrorists themselves. It is nearly impossible to kill all the terrorists without hitting civilians, especially due to the time lapse between hitting the mouse button and the impact of the missile, and so we enter a loop in which the situation only degrades instead of becomes any better. When realizing this, we may understand that the game is a criticism on the “War on Terror” and on the use of long-range precision warfare.

This game nicely illustrates that games are *systems* (Salen and Zimmerman 2004). A system is generally defined as “a set of interacting elements that form

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<sup>1</sup>The designers of *September 12th* stress that it is not a game. They call it a simulation. They did this to emphasize that their product really mimics a process in the real world and that its message should be taken seriously.



**Fig. 2.1** Shooting terrorists in *September 12th*. I just fired a missile and had to wait until the crosshair does not color red anymore. ©2003 Newsgaming.com. Used with permission

an integrated whole with a common goal or purpose” (Fullerton et al. 2008, p. 132) and games can be seen as a set of such interacting elements that work together on the basis of rules in providing players, the participants of a game, an experience. With *September 12th* we see that with a number of simple game elements, a crosshair which shoots missiles and civilians, dogs, and terrorists that walk around in a Middle Eastern Town, and with a number of simple rules that facilitate the interaction between these elements, a system is created with a purpose of explaining a political message. For reaching this purpose, the designers needed to consider and understand how the set of elements work together.

For this, it helps to know what the “complete whole” is and what “several incidents” should connect to it. Otherwise, as Aristotle argued, the “transpositional or withdrawal of any” of the needed incidents “will disjoin and dislocate the whole.” If citizens do not react to the death of another citizen by becoming a terrorist, the whole idea of *September 12th* would fall apart. It further helps to see what incidents are relevant and what are not. If incidents are “no real part of the whole,” they can be neglected. *September 12th* does not include a wide variety of long-range missile weapons, simply because its message could already be shown with the use of one of them.

In making sure a game is designed well, to get a “complete whole,” considerations have to be made of what to include and exclude and how everything needs to relate to each other. Creating such a balanced system is quite difficult, even for a seemingly simple looking game as *September 12th*. To assist in this, Triadic Game

Design (TGD) offers a way of thinking. To elaborate on this way of thinking, my attempt in this level is to get into the details of this idea by explaining its *foundations*.

I will first elaborate on the idea in general (see “The General Idea of Triadic Game Design”) and then continue to discuss each world separately (see “The World of Reality,” “The World of Meaning,” and the “The World of Play”). From there, I discuss how it relates to the player (see “What About the Player?”) and to other approaches (see “And What About Other Approaches?”). With all of this the foundations of TGD are laid down.

## The General Idea of Triadic Game Design

TGD is as its name suggests about “game design.” Game design involves the *art* and *craft* of constructing specific artifacts called “games” (Rollings and Adams 2003). It concerns an art, because as with most “designs,” it involves inspiration, originality, creativity, innovation, and many other aspects that make it an art. On the other hand, with designing games, it requires similar to designing a watch or a shoe, a certain skill. The more we practice, the better we become at it. This makes it also a craft.

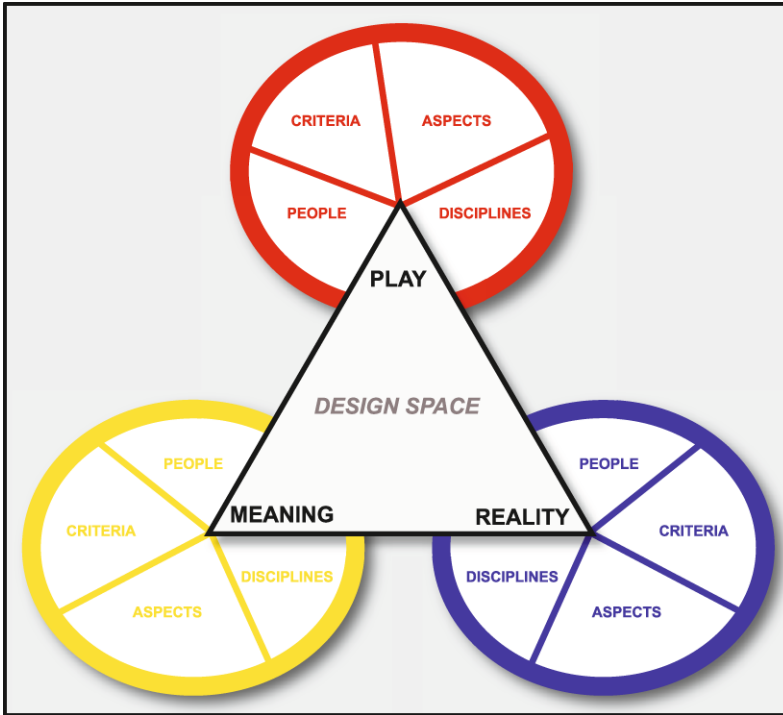
In designing games, nobody wants to reinvent the wheel or make mistakes that could have been prevented and everybody wants the practice to improve over time. For this reason, it helps to consider certain methods, techniques, principles, procedures, theories, and approaches. TGD concerns such a “game design approach.” It is an approach specifically oriented at games with a serious purpose. To further distinguish it from other approaches, it must be seen as a *design philosophy*. A design philosophy does not offer clear and detailed steps that designers need to take to design their artifact, but gives them an overall “way of thinking” of how they need to look at their practice.

This design philosophy stresses in particular two issues. It gives an indication of *what* the design of a game with a serious purpose consists of (see “Finding an Optimum”) and it tells *how* designers need to deal with this (see “Designing Concurrently”).

### *Finding an “Optimum”*

The name “Triadic Game Design” more or less indicates about “what” the design of games with a meaningful purpose consists of. It involves a triad that consists of the worlds of Reality, Meaning, and Play. Each world has its own people, disciplines, aspects, and criteria.

Yet, the worlds are inherently connected to each other. They are even interdependent on each other. If the world of Meaning is not related to Reality than what the world of Meaning tries to pursue becomes meaningless, as what is derived from playing a game cannot be applied outside the game. If the world of Play does not have some representation derived from the world of Reality, it becomes unplayable.



**Fig. 2.2** The design space of TGD

Without a representation, nobody can relate to it. Furthermore, if the world of Play is not related to the world of Meaning than no value will be derived from playing a game. This makes the worlds of TGD similar to the Borromean Rings (see Level 1). If one world is missing, the game collapses.

All three worlds are, therefore, equally important and they constitute the *design space* of developing a game (Fig. 2.2). The term “design space” is introduced by Simon (1969). It involves an imaginary place from where the design is created from. For games this means that the imaginary place is inhabited by three overlapping worlds and designers (consciously or unconsciously) consider these when creating a game.

Such creation does not come without any difficulty, because aside from solutions, the design space is also occupied by problems (Krishnamurti 2006). According to TGD, with games design problems can be related back to each of the worlds, because designing is mostly about solving tensions within and between the worlds that inhabit the design space.

Solutions to these problems can also be found in the design space. Solving tensions requires to “balance” the three worlds. Ideally, this means that a solution should be sought for that is most satisfactory for all worlds, but it often means a choice should be compensated with something else. In other words, to deal with

the tensions designers have to make many *trade-offs* within and between the three worlds.

For example, to play *September 12th* is not much fun. The designers compensated the world of Play, however, by creating a comical fictional world. Additionally, Reality has been much traded off against Meaning and Play. The game has a simple message and simple game mechanics, and so the complexity of the situation had to be reduced to a model of reality in which resorting to violence under any circumstances causes more violence in response.

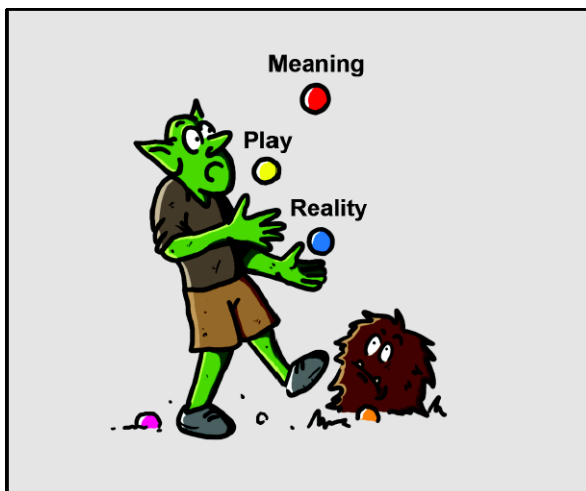
If a game turns out to be unbalanced, which means that one of the worlds is favored too often, the danger is that the ultimate criterion of *harmony* may not be reached. If this happens, it is unlikely that the game achieves for what it is designed for. It might be inappropriately linked to the real world, not create the value that goes beyond the context of playing the game, and/or it might not be engaging and enjoyable enough for players to devote their time to.

I consider *September 12th* to be a balanced game, as all three worlds are nicely reconciled with each other. It can, however, certainly be criticized. Costikyan (2003) argued, for instance, that it gives the idea that “terrorists are perfectly peaceable people who toddle around until nasty, evil Western imperialists destroy them and half of their neighbors through indiscriminate missile attacks.” This shows that the model of reality is to a large extent imperfect. But to deal with this imperfection, it would severely affect its message, even if it is a bit simplistic, and cause the game to be unbalanced.

Based on the previous, it should become clear why designing games with a serious purpose is so difficult. Designers have to be equally concerned about the worlds of Reality, Meaning, and Play. This makes designing games a “multi-objective problem” rather than a “single-objective problem.” Single-objective problems always have a single optimal solution: they have one goal and can be optimized toward this goal. For example, if in a tender proposals are judged on costs, then the decision can be optimized by simply choosing the proposal with the least amount of costs.

For multi-objective problems an optimal solution does not exist. To solve these problems, people have to look for the best solutions, the ones that are “satisficing” to most of the criteria. In looking for these solutions, people may find multiple “optimal” solutions. By taking the tender example again, if proposals are judged on quality next to costs, a trade-off has to be made, because a better quality leads to more costs. Those who submit a proposal as well as the ones who make the final decision have to consider how they will deal with the “space” that is constituted by quality and costs.

According to TGD, in developing a game designers have to deal with the design space that is constituted by the worlds of Reality, Meaning, and Play. In finding an “optimum” in this space it is important that they take the second issue into account: to design “concurrently.”



**Fig. 2.3** Designers should act like jugglers by designing their games concurrently. Drawing by Rens van den Bergh

## *Designing Concurrently*

To look for “optimal” solutions within the design space we hit the second issue related to TGD, which follows logically from the first. If designing a game involves balancing three equally important worlds, then it follows that these worlds should be considered *at the same time in critical parts of the design process as much as possible*. If this does not occur, designers run the risk that one or two of the worlds are prioritized too much and this will make the game unbalanced.

Considering the worlds “at the same time” involves to *concurrently* look at several aspects, criteria, and other relevant elements for designing a game and not separately. The need for *concurrent design* also follows logically from the idea that games are systems (Fullerton et al. 2008; Salen and Zimmerman 2004). Games consist of tightly coupled interacting elements that work together in providing an experience. This means that changing any of the elements will affect the “complete whole,” the system at large. And a small change can have big ramifications.

A well-known example of such small change with big consequences concerns the game *Counter-Strike*. This game is very similar to other shooters, like *Quake III Arena* and *Unreal Tournament*, but unlike these games *Counter-Strike* is not a mindless action game. It is rather a more team-oriented game and this has been the result of just some minor changes in the game system:

Unlike *Quake III Arena*, *Counter-Strike* is famous for its team-oriented gameplay, but since there are no rules in *Counter-Strike* that tell players to “play team-oriented,” the question is, what makes *Counter-Strike* a team-oriented game? *Counter-Strike* only adds a few varia-

tions on the team-based modes of *Quake III Arena*: Players do not respawn<sup>2</sup> during a round, there are goals that can win an entire round for a team, and players move more slowly and are much more vulnerable. As it turns out, these variations completely change the game to be more oriented toward team play. Since the player has only one life per round, death becomes something to be avoided at all costs. This makes it very important for players to work together. In even a simple skirmish, being in a group is much better than being alone. Having your back covered becomes important. Communication therefore becomes important. In this way, very simple rule changes can completely change the gameplay of a game. (Juul 2005, pp. 89–90)

To perceive the effects of a design choice, the game system as a whole should be considered. With *Counter-Strike* we clearly see that small changes led to a complete different game—the system as a whole changed. And with this game Juul (2005) only looked at it from the world of Play. If we would also look at it from the world of Reality, it could be said that while it is still an entertainment game, it has become far more realistic compared to real combat situations. Additionally, if we would look at it from the world of Meaning, a clear emphasis shift is made from learning eye-hand coordination skills and training reaction time toward collaboration and communication skills. From this we see that games are so tightly coupled that small changes in a game system have an effect on all three worlds.

To make sure that all three worlds are appropriately taken care off, designers should act like a juggler in creating their games (Fig. 2.3). They have to keep three “balls” going and up in the air. Doing this requires to pay attention to all three balls “at the same time.” The three balls represent, of course, Reality, Meaning, and Play.

Designing concurrently contrasts with *procedural design* approaches. These approaches emphasize that design takes place in steps or phases. This means that design issues are not considered at the same time, but in a certain sequence. TGD and its concurrent design is, however, not completely incompatible with these approaches. In fact, they can be used next to each other.

Take the approach by Duke and Geurts (2004), which draws heavily upon the initial work by Duke (1974). It consists of five phases with in total 21 steps that designers can use to anticipate each phase from the outset. This approach for the design of tailor-made analog games, specifically in the area of policy and management, has been tested and developed for over a period of 40 years and is depicted below.<sup>3</sup>

**Phase 1: Setting the stage for the project—complete the essential preliminaries.**

Step 1: Administrative set-up—organize the project.

Step 2: Define the problem—what prompts this project?

<sup>2</sup>When players die in a game, and the rules allow for this, they can “respawn” somewhere. This means they appear alive somewhere in the game environment and are able to continue playing.

<sup>3</sup>I made some adaptations to the approach by Duke and Geurts (2004). They speak, for example, of the creation of “policy exercises” or “policy games” which are participatory methods for actual policy and decision making. I renamed this to “games,” because I think their approach goes beyond the creation of these “policy exercises.” I also renamed phase 5 from “Implementation” to “Deployment,” as implementation has a different meaning in the context of digital games. Last but not least, I further adjusted the steps in such a way that they are understandable to any reader and can be easily related to the aspects mentioned in this book.



- Step 3: Define the purpose of the project—what are the primary objectives?
- Step 4: Relate objectives to different possible methods—is a game appropriate?
- Step 5: Specifications—constraints and expectations.

**Phase 2: Clarifying the problem—define both the focus and scope.**

- Step 6: Defining the model of reality—content, boundaries, interrelationships.
- Step 7: Displaying the model of reality—create a lucid depiction of this model.
- Step 8: Negotiating the focus/scope with the client—set a clear target.

**Phase 3: Designing the game—create a blueprint.**

- Step 9: Translate the model of reality to a game—make a model of a model.
- Step 10: Definition of gaming elements—describe each part of the game.
- Step 11: Repertoire of techniques—do not reinvent the wheel.
- Step 12: Select a format—what style is appropriate?
- Step 13: Game concept—document the idea.

**Phase 4: Developing the game—make sure it works.**

- Step 14: Build, test, and modify a prototype—put the pieces together.
- Step 15: Technical evaluation—ensure an efficient and effective tool is created.
- Step 16: Graphic design and printing—develop a professional presentation.

**Phase 5: Deployment—ensure proper use by the client.**

- Step 17: Integrate the game into the context—make it fit.
- Step 18: Facilitating the game—practical use of the game.
- Step 19: Dissemination—deliver or publish the game.
- Step 20: Ethical and legal concerns—protect the design.
- Step 21: Final report—ensure proper closure.

This approach can to a large extent very well co-exist with TGD, because designing games does indeed consist of certain phases and steps. As for the phases, at the start, for example, no discussion should take place about what the rules of the game are. The discussion should be about defining the problem and purpose. In addition, a game cannot be tested if no design exists. And finally, it is simply impossible to deliver a game while also designing it. The phases, therefore, make sense.

As for the steps, designers cannot do research into the topic of the problem they are dealing with, while at the same exploring, for example, learning theories and thinking about specific game mechanisms. They do this in separate steps. And although in practice this might be different, it would be a logical first step to think about the problem and then define the purpose of the project. For this reason, taking steps when designing a game, such as depicted with this approach, is unavoidable.

TGD delineates, however, from procedural design approaches in how the development of the *core of the game* is depicted. With this, I refer to what the game system consists of: what are its elements and how do they relate to each other? In developing this system, integration takes place—a synthesis has to be made. Findings from the topic of the problem are combined with insights from the exploration of learning theories and with ideas about game mechanisms. In this “critical part” of the design process, designers should think concurrently—they have to think of how they combine the elements of the worlds of Reality, Meaning, and Play together to get a balanced game.

Such concurrency and integration can hardly be derived from the approach by Duke and Geurts (2004). It more or less suggests that designers first have to take



care of the world of Meaning by only defining the purpose, subsequently delve into the world of Reality by developing a “model of reality,” and when this is done, concentrate fully on the world of Play. While each and every world is certainly and in many occasions during the design process looked upon separately, in the critical parts of the process designers have to consider all three worlds simultaneously “as much as possible.”

I mention “as much as possible,” because in practice it is often not possible to take everything into account at the same time. Some potential problems may not be known upfront and as is often with systems, especially the more complex ones, the effects of changes cannot be entirely known upfront as well and these changes, as seen with *Counter-Strike*, can have enormous effects. Without having a clear picture of the whole, decisions are difficult to take in creating the core of the game.

To deal with this, *iterative design* is needed (cf., Boehm 1988; Fullerton et al. 2008). Such design suggests to progressively develop a games based on a cyclic process of prototyping, testing, and evaluating the results. Based on the results of an iteration, changes and refinements are made. This repeated cycle of prototyping, testing, evaluating, and refining continues until the requirements are satisfied—that is, a balance has been found within and between the three worlds.

From this, we see that with “designing concurrently” I do not mean that everything should be considered at the same time. This is impossible. Steps and phases remain part of the design process. Iterations are also needed, because it cannot be expected that designers get it right the first time around and they may not have a clear idea of what they need to consider. What I do mean by designing concurrently is that within and between certain steps and phases, and especially in the critical parts of the design process, where the core of the game is developed, designers should act much like a juggler by taking various elements into account at the same time.

But to be able to juggle it is necessary to know with what to juggle. For this reason, I will now delve into each of the worlds that constitute the design space. I will start with the world of Reality.

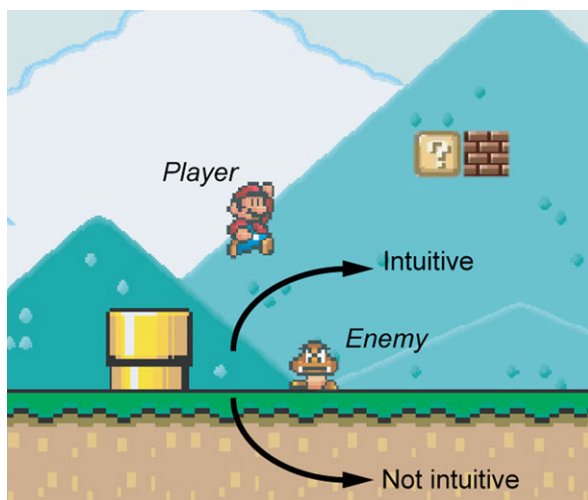
## The World of Reality

Most games are in some way connected to the physical world. They involve many “fantasy elements,” such as no gravity, not being able to die, or having three lives. Nevertheless, there are always “things” that are recognizable and to whom we can relate to in reality (whether fiction or non-fiction<sup>4</sup>). If not, a game would not be

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<sup>4</sup>Games may also refer to (other) fictional “things” from reality, like movies, cartoons, or books. For example, some games, like *Levee Patroller*, borrow the concept of “teleportation” from the *Star Trek* series which is the ability to disappear at one location and appear at another in a split second (and to which the catch phrase “Beam me up, Scotty!” is related to). Of course, these fictional “things” bear also some connection with reality. This makes games a copy of a copy whenever they refer to these other fictional “things,” or, in the words of Baudrillard (1981/1994) a “simulacrum.”

**Fig. 2.4** Intuitive behavior in games as *Super Mario Bros.* Screen shot is taken from a Flash version of the original game. ©1985 Nintendo



meaningful to us and we are unable to play it. For example, I do not know any game in which players have to avoid an enemy by “jumping” underneath it (Fig. 2.4). Players always have to jump “over” the enemy, because that is how things work in reality as well. Of course, players cannot jump that high in reality. In fact, it is even unlikely that they will ever encounter the types of enemies in reality (ever seen a “poison head crab”?<sup>5</sup>). The point is that despite all the fiction a game may contain, it always maintains some connection with reality to make the experience intuitive and understandable.<sup>6</sup>

The “connection” between a game and reality suggests that games contain an underlying *model of reality*. The latter says what it is: a representation (of parts) of reality.<sup>7</sup> When a game is developed, designers—consciously or unconsciously—consider aspects of the real world, like people, organizations, objects, variables, and relationships, and put these together into this model. This can be as simple as representations of familiar objects like a car (together with for example Newtonian

<sup>5</sup>A poison head crab is one of the enemies players can encounter in *Half-Life 2*. According to Lamar (2008) it is the second most terrifying game enemy of all time.

<sup>6</sup>Some games, in particular *indie games* (i.e., games developed by independent developers), make actually use of creating an experience that goes against people’s intuitive behavior. *The Path*, for example, only becomes interesting when the player wanders around instead of complies with the explicated goal of the game which is to walk from A to B. *Braid* is another game that requires players to reconsider their own logic of how the world on their screen unfolds.

<sup>7</sup>Instead of “model of reality” some scholars call it the “simulation model” and reality the “reference system” (cf., Peters et al. 1998). I opted instead for “model of reality,” because aside that this term clearly refers to the world of Reality, the other term, “simulation,” can cause confusion. Simulation can also refer to the artifact itself, to a genre of games, or to a traditional tool (in operation research) which uses computer models to calculate possible scenarios and which have little to no association with games, whereas I just wanted to refer to something that is part of every game. For this reason, I chose to use a term that is less contested.

physics of how objects move) to such elaborate representations as a political system (with political parties, issues, and secret agendas). It depends very much on the type of game and its purpose how elaborate, realistic, and valid this model needs to be.

To illustrate, a game to promote fitness may be satisfied with simple statistics that indicate how many calories people burn per type of activity, while a game about educating medical students about the human body needs to contain every “nitty-gritty” detail.

Developing a model of reality requires domain-specific knowledge. If the game is, for example, about computer viruses, expertise on cybersecurity is needed. To retrieve this domain-specific knowledge, *subject-matter experts* are indispensable during the development of a game (although it may well turn out that they cannot give any clear answers or they may not be willing to share information). They can help in determining what the crucial aspects of “reality” are and can also help in how these need to be represented.

The eventual model of reality, and this I need to emphasize, is not the game itself. The model of reality is a blue print, a *conceptual model*, on which the game is partly based. The model co-evolves during the development. When certain changes are made, they may very likely affect the underlying model of reality.

Something else that needs to be stressed is that any model of reality is a subjective depiction of reality. Reality is interpreted, constructed, and translated into a model by a group of designers in collaboration with others and it may well be that another group may achieve a completely different model. This can happen amongst many other reasons due to contrasting theories on the topic, different information sources, different design choices, ambiguous or equivocal information, knowledge gaps, differences in scope, budget, and purpose. It is thus very unlikely that two teams come up with the same model.

What we, however, can observe is the sort of *domains* for which games are being developed. With domains, I refer to specific fields in which games are applied to. Below I discuss some of the domains (in an alphabetical order) and the games associated with them to give an overview of games with a meaningful purpose from this world. The domains, as with everything else in this book, are by no means conclusive. It is simply one way of organizing.

## ***Business & Management***

The use of games in business and management has a long history (see Level 1) and are also referred to as “corporate games” (Michael and Chen 2006). Many business games are educationally oriented. They are used within business schools or in the businesses themselves. Although less prominent, for quite some time games have also been used as organizational interventions to evaluate business programs, tools, or let employees get used to new ways of working and thinking. Currently, businesses are considering the usage of games because the generation that grew up with Super Mario is entering the workplace and may require another

**Fig. 2.5** Finding statistics for starting a business process management evaluation in *INNOV8*. Logan just found the call statistics at the IT department and now needs to look for the resource costs at the financial department.  
©2007 IBM. Used with permission



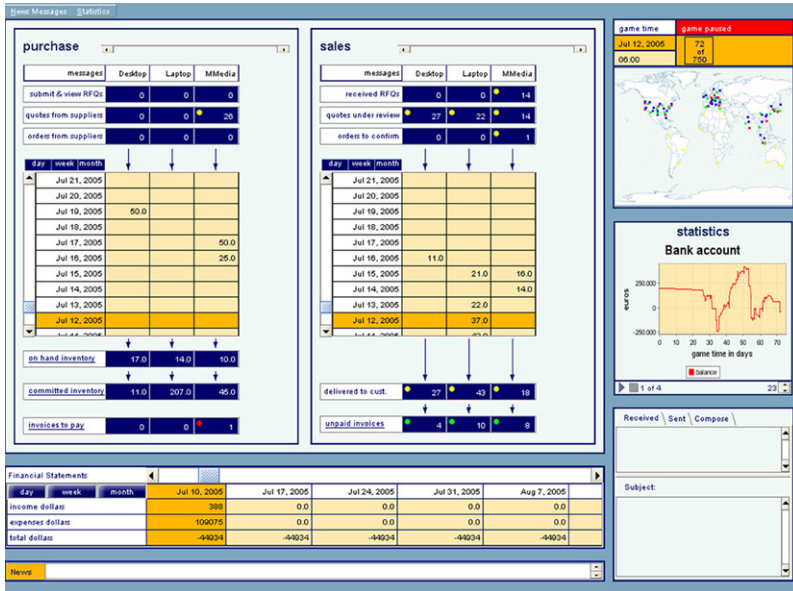
way of working (Beck and Wade 2004; Herz 1997; Prensky 2001; Tapscott 1997; Veen and Vrakking 2006), and a number of organizations are experimenting with increasing the productivity of employees by using games (Edery and Mollick 2009).

To give an example of game in this domain, let us consider a game that has been developed by a business itself for business schools. Playing the game *INNOV8*—a game developed by IBM—should give a better understanding of how effective “Business Process Management” (BPM) impacts an entire business ecosystem (Fig. 2.5). BPM is a management approach focused on understanding, managing, and improving business processes. To achieve this, the approach stresses the supporting and enabling managerial possibilities of using technology for optimizing processes by making it possible to design, model, and monitor them.<sup>8</sup>

To learn about BPM, the game features a fictional call center agency, “After Inc.,” who has a process model that is functioning sub-optimally. As the protagonist “Logan,” a young female business analyst, players must discover the current model (the “as-is model”), find out why it is under-performing and then optimize it to meet the demands of the market (the “to-be model”). In essence, players must first find and collect the separate elements that make a model, such as resource costs, performance data, and other statistics, by visiting the departments within the corporation that are responsible for this, like human resources, finance, and the IT department. After that, players can start revising the as-is model and simulate the to-be model by changing variables and looking at the performance indicators. *INNOV8* thus actually offers playing with a hardcore simulation model within a game environment.

A game that has been played for a much longer amount of time within business schools concerns *The Beer Game* (Sterman 1989). This game does not involve or promote beer drinking, but is rather about supply chain management. Teams of players take up the roles of retailers, wholesalers, distributors, and factories, and need

<sup>8</sup>In the glossary of *INNOV8*, BPM is defined as “a structured, often cross-functional approach—combining management methods with information technology—to improving business process over time or adapting them to meet new customer or market needs.”



**Fig. 2.6** Interacting with a spreadsheet and other players all over the world with the *Global Supply Chain Game*. ©2005 Delft University of Technology. Used with permission

to work together to deliver beer to the customers while minimizing the costs and avoiding out-of-stock situations.<sup>9</sup>

In the aftermath of this game, many other supply chain games have been developed. A quite interesting one concerns the *Global Supply Chain Game* (Corsi et al. 2006). This game is a “distributed game.” It can be played simultaneously with players all over the world, in the same vein as most Internet-based games. In one session, the game was, for example, played with teams from business schools from China, France, the Netherlands, and the USA. Another striking point to be made is that this game, like many others, is essentially an *interactive spreadsheet* (Fig. 2.6). Players can adjust variables like they would if they are sitting behind their desk and using the tools they would normally use, like Microsoft’s *Excel*, to make decisions. Playing these games lets players, therefore, also learn of how to work with spreadsheets (and potentially other tools).

An example of using games to increase productivity can be found in the work place of Microsoft (Edery and Mollick 2009; McDonald et al. 2008). To catch as

<sup>9</sup>The *Beer Game* was originally built to research and educate the occurrence of the “bullwhip effect”: when the inventory levels of the retailer decline, it is followed in sequence by a decline in the inventory of the other roles, the wholesaler, distributor, and eventually also the factory. When inventory falls, players tend to increase their orders. Faced with rising orders and large backlogs of unfilled orders, the factory eventually brews and ships huge quantities of beer, and inventory levels surge. Using a very simple game, in which players only have to place orders, this effect can be demonstrated.

many bugs as possible before launch, the Windows Defect Prevention Team tries to get as many employees involved with bug testing. This is normally quite hard. People are busy and will not volunteer as easily unless they are required to. This changed when the team first set out to create a simple “game,” *The Beta1 game*, in which players could earn “letters” which were visible to everyone who participated on a score board. Installing the version would earn players a “b,” voting it a “e,” and running it overnight a “t,” and so forth.

With this game, participation quadrupled and due to this success, the team created immediately a follow up, *The Beta2 game*. This game expanded the original one by awarding points for a wider variety of activities, including prizes, and giving away physical representations of game participation, such as wristbands. This was a success again and shows that games can very well be used within the actual business processes themselves.

## Health

A domain that has found a widespread use of games, for consumers as well as professionals, concerns “health.” For consumers, we see a huge influx of games to motivate people to be healthy, by for example motivating them to exercise or take medication. The first is known as “exergaming,” and is becoming more and more popular, in households as well as in fitness centers. These games “force” players to perform exercise movements to play the game. These exercises can be mapped one-to-one to real world exercises or they are needed to support something completely fictional.

For example, in *Wii Fit*, one of the exercises involves hula-hooping and requires players to make circular body movements to ensure that their virtual alter ego’s hula hoop keeps on going and does not fall onto the ground. In another exercise, however, players have to shift their balance to get balls into holes. It can be expected that exergaming becomes gradually more popular when the techniques to infer player movements become more precise.

As for medication adherence, although not so many have been developed compared to exergaming, one quite successful one, the game *Re-Mission*, comes to mind (Kato et al. 2009; Tate et al. 2009). In the game, which is aimed at enhancing the physical health and psychological well-being of young people with cancer, players control a nanobot Roxxi and enter the bodies of teenage cancer patients to investigate symptoms, destroy cancer cells, eradicate bacteria, stop metastases, and manage treatment effects (Fig. 2.7). The way this is done is by means of shooting. Roxxi is a fully armed warrior and the idea is that players use her arsenal to fight cancer colonies. Study results show that those who played the game, even if only for an hour, adhere much more to their medication intake than those who played some other game.

Part of these results can be explained by another result. It was found that players’ “self-efficacy,” a belief in their own ability to control and cope with something, in this case with cancer, improved. In other words, playing the game gave players the

feeling that they were able to deal with their own disease. This psychological effect is probably in particularly instilled by the strong metaphor of fighting cancer cells in someone's body. The resulting sense of agency and power was confirmed by one of the patients: "It feels like you have control over your own destiny" (Tate et al. 2009, p. 30). Others expressed a visceral sense of revenge while destroying cancer and its side effects.

On the professional side, games are used to treat patients. With *SnowWorld*, for instance, burn patients explore an ice world and shoot snowballs at snowmen, robots, and penguins to alleviate their pain (Hoffman et al. 2007). The same technique is also used to treat phobias and Post Traumatic Stress Disorder (PTSD). As for the latter, *Virtual Iraq*, is an environment for treating veterans by simulating sources of combat stress. The interesting aspect of this project is that it does not only include auditory and visual stimuli, such as images of wounded civilians and the sound effects of gunshots and bombs, but also olfactory, like the smell of burning rubber, diesel fuel, and spices, and tactile ones, such as the vibrations that one feels when sitting in a jeep. The idea behind the treatment is to gradually re-introduce victims to the experiences that triggered the trauma, making the memory more tolerable in this way. Early results show that this approach is very promising (Gerardi et al. 2008). For example, one patient indicated that after four sessions of 90 minutes, he no longer needed to "keep thinking about" the identified trauma.

But for health professionals themselves, games are also used. In fact, according to Bergeron (2006) this is a huge market, because there is a need for physicians, nurses, and other clinicians to amass a number of continuing medical education (CME) credits every year to maintain their licensure. They can attend lectures, take tests, or—nowadays—play a game (if it is approved for CME credits). The types of games range from teaching how to handle surgical equipment (cf., Rosser et al. 2007) to teaching how to operate and deal with patients in general.

## ***Military***

In Level 1 I discussed how important gaming is to the military and how much they are on the forefront when it concerns the use of new technology. The game *America's Army* is another example that the military is pushing the state-of-the-art (Fig. 2.8). This game, of which at the moment the third version is released, is an enormous success. When the first version was released, in 2002, it was conceived and openly publicized as an Army recruiting and communications tool. In the first six months, over a million users registered. Currently, it has 9.5 million registered users and is considered one of the most popular online games.

In the game, players first have to go through training before they can enter the combat missions and earn medals of honor (Zyda et al. 2003). In this training, it becomes immediately clear that although the game looks and feels much similar to most entertainment military games, it is much more realistic, and more importantly, it forces players to abide by the rules of warfare. If players do not, the game is merciless.





**Fig. 2.7** Fighting cancer cells like the lymphoma cell inside a patient's body with *Re-Mission*. ©2006 HopeLab Foundation. Used with permission

For example, if players point their gun toward their drill sergeant in the training, they find themselves in a cell and they need to completely restart the game to play again. After continued violation of the rules, players are even eliminated from the game. They need to create a new account, which means that they have lost everything that they literally and figuratively speaking have “fought” for. This way, the game enforces players to learn and stick to the rules.

On the professional side many forces all over the world make use of *Virtual Battle Space 2*. This game environment makes it possible to flexibly create scenarios and re-enact these with soldiers under the guidance of facilitators who can adjust the scenarios in real-time and role-play some of the characters in the game. I once had the opportunity to play this game and I was amazed how much our group—consisting of people with no military experience—learned in just half an hour in terms of strategy, collaboration, and engagement rules. Where at first all of us ran around in an open field like chickens with their heads cut off and as a result were being shot by just one sniper, we subsequently first grouped together, thought of a strategy, discussed how we would communicate, and moved in two teams slowly and cautiously alongside the houses, so we would not be easily shot by snipers.

Military games are not necessarily only about combat. I already mentioned *Virtual Iraq* which can be considered a military game as well. Another game concerns *Tactical Iraqi* (Surface et al. 2007). This game teaches soldiers Arabic and local cultural customs. Often, language and culture can cause a problem when soldiers have to engage with local people. They can use an interpreter but these are not always there when needed. This game teaches in such circumstances what to say,



**Fig. 2.8** Shooting the instructor is not a clever idea to continue playing *America's Army*. ©2009 U.S. Army. Used with permission

how to say it, and when to say it. Whereas other methods only focus on spoken vocabularies and pronunciation, this game also covers practical cultural knowledge, sensitivity, and awareness—including non-verbal gestures, etiquette, and norms of politeness—that are critical for successful communication.

In the game, players have to interact with virtual humans and by means of speech recognition technology, which interprets the words and pronunciation of the players, the virtual humans become trustful and cooperative, and provide the information players need to advance if they speak and behave correctly. Otherwise, the virtual humans will obstruct them from advancing. It turned out that in as a little as a week, players become quite proficient and due to this success other versions have been made that focus on the Dari, French, Indonesian, and Pashto language.

### ***Politics & Society***

Expression by means of games clearly occurs in the domain of politics and society. Right after “Joe the Plumber” was mentioned by John McCain a number of times in his race for presidency against Barack Obama in 2008, a game appeared on the Internet with was titled as *Joe the Plumber Game*. In this case it was just merely politically framing an existing game format of connecting pipes from one end to another, but it was political nonetheless.

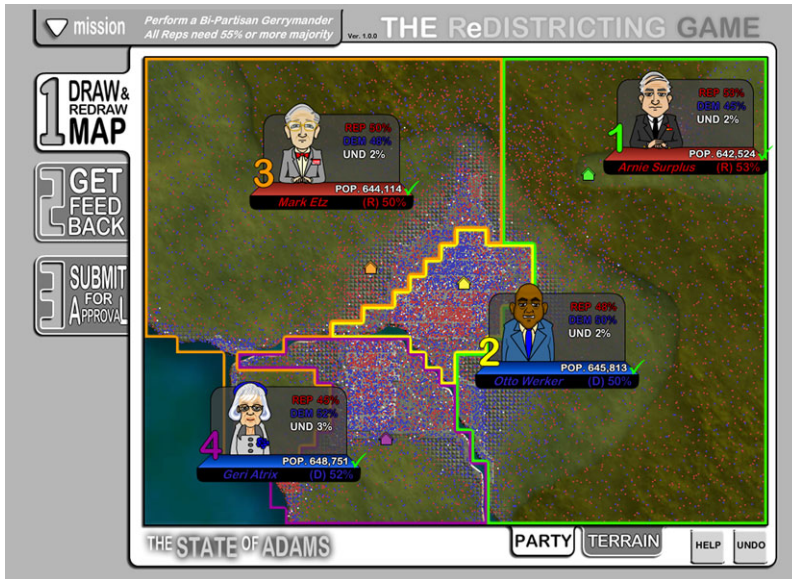
In other instances, games can be found surrounding political and societal events that go much further. Oftentimes, these games, which are also referred to as “news-games,” are developed by young individuals. Supported by game authoring tools, these technological savvy youngsters create rather simple games that support, criticize, and make fun of politics and societal events. And oftentimes as well, these games spark great controversy. One such game, *Super Columbine Massacre RPG!*, concerned a re-enactment of the school shootings at Columbine High School in 1999 and was developed in six months by Danny Ledonne who was 22 years old at the time.

But also companies and institutions employ games to support, criticize, and make fun of politics and societal events. *The ReDistricting Game* can, for instance, be seen as a critique on the American political system in which in most states the state legislators themselves are able to draw the lines of voting districts, making it vulnerable to a wide range of abuses and manipulations (Fig. 2.9). The game offers five different missions, each with a different objective yet a similar game mechanism which simply comes down to drawing and redrawing districts. By exploring how the system works, the game allows players to see how one of the most important aspects of the American political system is open to abuse and how it can possibly be improved.

Aside from criticizing a political system, *The ReDistricting Game* is also educationally oriented as the concept of redistricting is not so well understood by citizens. This educational empowering of people is reflected in many more interesting games. Another game, called *PeaceMaker*, is about one of the most difficult political conflicts of the past decades: the Israeli-Palestinian conflict. This game puts players in the shoes of the leader of one of the sides (Fig. 2.10). Players can view information about stakeholders, such as Hamas, look at polls, to see how well they do on economy, leadership, and sympathy, and take a variety of actions, political, security, construction, or generic ones. Throughout the game, in which they must try to overcome the zero sum game by balancing the needs and concerns of multiple perspectives, they can be faced with all kinds of events that may require the player to take another course of action.

Last but certainly not least, although certain politicians pursue a crusade against games, a number of them make increasingly use of games themselves, for advertising and campaigning. *The Howard Dean for Iowa Game* was, for example, created to let supporters understand the process and power of grassroots outreach and to encourage them to participate in pre-caucus campaigning in Iowa or in their local area (Bogost 2007). All of this was, of course, in support of the presidential candidate Howard Dean for the U.S. 2004 elections.

The goal of the game is to get as much supporters as possible for the Iowa caucus. This can be done by strategically placing campaigners on a map of Iowa who will recruit other supporters and promote the campaign. The effectiveness of each of the new supporters that are placed on the map is determined in mini-games that represent three typical campaign activities: sign-waving, door-to-door canvassing, and pamphleteering.



**Fig. 2.9** Drawing lines for creating favorable voting districts in *The ReDistricting Game*. The blue and red dots represent Democrat and Republican voters, respectively. ©2007 University of Southern California. Used with permission

## Public Policy

Similar to business & management and military games, public policy has a rich history with gaming as well, in particularly when it comes to analog games. However, in the wake of *SimCity* many policy oriented digital games, also referred to as “governmental games” (Michael and Chen 2006), have been developed. These games, like *Virtual U*, are in concept very similar to *SimCity*. They put players in a helicopter mode—also known as the “god mode”—which gives them a complete overview of what is going on and enable them to take particular actions to influence what they see. With *SimCity* actions pertain to urban planning by deciding where to place roads, houses, and industries, and with *Virtual U*, this concerns allocating budgets and making decisions on faculty members, courses, admissions standards, facilities, and so on. By playing these games, users will get an elaborate understanding of the intricate relationships of the various variables that are important in the domain of public policy.

Such an understanding or “awareness” is also used to educate the public about the difficult dilemmas that the government is struggling with and to engage the public with the debate. The designers of *Budget Hero*, a game oriented at the federal budget of the USA, have attempted this. As a citizen it might be easy to complain about why the government does not spend X on Y and by playing this game they may understand why. In fact, they may not spend X on Y considering the limitations of the budget and other hard pressing issues either. An additional value of games





**Fig. 2.10** Considering diplomatic actions in *Peacemaker*. The security actions are shown, like police and army coverage, checkpoints, travel restrictions, and extreme measures. ©2007 ImpactGames. Used with permission

as *Budget Hero* is that they offer governments insights into the choices the public makes.

This “participatory model” of engaging citizens in the public policy debate can be extended to the public policy “arenas” or “rounds,” the places where policy is made. Public policy can be characterized as being faced with multiple stakeholders, like governments, companies, and citizens, who have their own mental models, interests, values, and so on (Mayer 2009). This dealing with stakeholders could take place in a game. By putting them together in a game environment, the different interests and perspectives can become known and a “solution” can be sought for.

Although not many digital games have done this so far, actually one of the first “next generation” games with a serious purpose, those that use digital game entertainment techniques, applied this “multi-stakeholder approach.” This game called *NitroGenius* was developed specifically for a conference on nitrogen, in which scientists, policy makers, researchers, and industry leaders gathered to discuss nitrogen’s role in the environment. This discussion was needed, because regarding global warming and the release of gases, nitrogen often failed to be mentioned, while it has disastrous effects on the environment and health. The idea was to learn and discuss about the complexities of nitrogen pollution through a game.

In the game, players take up the role of the government, industry, agriculture, or society and get specific objectives. The government needs for instance to support economic growth and guard public health, while industry should aim to maximize profits. Every round players can make decisions regarding certain policy options,

like investing in research or reorganizing the company, and others may be able to cancel certain choices. By doing this, in a simple way the complex relations within the nitrogen pollution situation become known and an optimal policy which reduces pollution while maintaining the lowest costs with the fewest negative impacts on society can be sought for.

## ***Safety & Crisis Response***

Although safety and crisis response is an important governmental responsibility, the extent to which gaming has been applied in this area has been so enormous that it can be considered a domain in and of itself. Additionally, safety and crisis response is not solely exclusive to governmental institutions. Many companies are concerned about this issue as well.

Oil companies are, for instance, very much concerned about safety and crisis response. On drilling sites many hazardous situations can occur and to train employees in recognizing such situations, they are exploring the use of game technology. For exploring its potential, a prototype game was developed called *Supervisor*, in which the player is supposed to handle hazardous situations on a drilling site, by taking care of health, safety, and environment regulations and by carefully watching personnel. It could happen that personnel is not paying attention and position themselves at unsafe locations when, for instance, a truck is unloading its load (Fig. 2.11). In that case, the player should respond by directing the worker to a safe area.

Most games that can be affiliated with this domain pertain, just like *Supervisor*, to the operational level. This is the level where professionals need to deal with the situation directly. Such professionals range from police officers, fire fighters, emergency medical personnel, to even, of course, levee patrollers. The reason why gaming has found such a widespread application in this level is that using games enables these professionals to get experience in a relatively safe environment.

On a tactical or strategic level much less games are being developed. *Incident Commander* is, however, one of such games. Multiple scenarios can be trained, like school hostage-taking, chemical spills, terrorism, and severe weather, with up to 16 players simultaneously who can assume different roles. The game can also be customized to create specific scenarios that the users have in mind. Like in *SimCity*, players look at the game from a helicopter perspective and they are challenged to coordinate a multi-agency (fire, police, public works, logistics units, and more) to respond appropriately to the situation at hand by taking the right actions and communicating effectively.

Similar to the other domains, safety and crisis response games can also be oriented at the public at large. It is extremely helpful if citizens stay aware of the risks and try to minimize these themselves to some extent. The game *FloodSim* demonstrates this potential. It aims to raise awareness to issues surrounding flood policy and government expenditure and to increase citizen engagement in this matter.

In the game, players need to make decisions regarding what to invest to make the UK safer against flooding. Interestingly enough, the game is developed by one



**Fig. 2.11** Supervising personnel and regulations in *Supervisor*. Notice that one of the workers should be directed to a safe area. ©2009 Delft University of Technology. Used with permission

of UK's largest insurers. The 2007 floods cost the UK's insurance industry approximately £3 billion, and with the climate change, the chances of similar floods occurring are higher than ever before. For this reason, and this is stated at the game's website, flooding is a big issue for the insurer and it is important to keep flooding high on the political agenda.

## Science & Education

The use of games for education is the most common association people have with games. A game is seen as one of the tools to teach kids and students. Some consider it even as “the tool” for education, since games fit quite well with the educational philosophy put forth by John Dewey (1938) and many others who stress that education should be grounded in experience. Whereas most text books are rather abstract and dry, a game can make a topic come alive and let kids and students learn and apply the knowledge and skills in settings where they are actually needed (Shaffer 2006).

With this in mind, it is not strange that two of the topics for which games are mostly developed for concern either physics or history. The first is one of the, if not the most abstract topic that students are confronted with. If we talk about molecules, atoms, or even quanta, we refer to “things” that we cannot see with our own eyes. Games, like *Supercharged!*, can enable students to critically engage with such scientific phenomena by forming and testing hypotheses. For instance, in this *Supercharged!*, students need to navigate a spaceship in a three dimensional environment of electromagnetic mazes by first placing charged particles and then controlling the electric charge (either positive, negative, neutral, or dipole) of the ship. The goal of



*Supercharged!* is to help learners build stronger intuitions for electromagnetic concepts and findings suggest that it is effective in achieving this (Squire et al. 2004).

The reason why history games are so popular is not strange. We cannot easily visualize what it must have been like back in the days. Sure we can visit a museum or ruin, but this just gives us a tip of the iceberg. With a virtual environment we can completely step into the worlds of Cleopatra or Christopher Columbus. This appeal is quite strong, and not only educationally, because many entertainment games are set in historical settings. Aside from *Civilization* one of the better known historical games used in the classroom concerns *Europa Universalis*. In this game, players need to explore, trade, make ware, and be diplomatic in the period of 1453 and 1820.

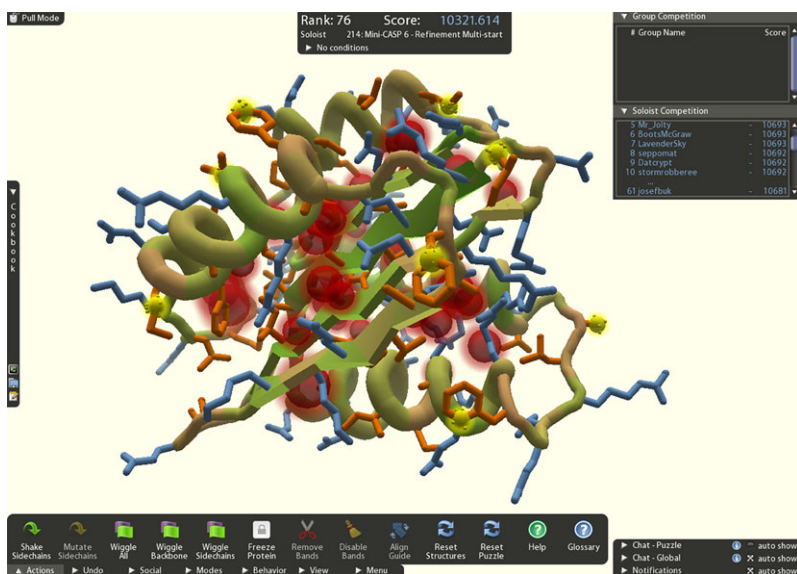
As for “science,” the use of games is much more limited, although an exciting development is taking place in which games are contributing to science (cf., Bainbridge 2007). Take *Foldit* (Fig. 2.12). In this puzzle game, players have to fold proteins, the workhorses in every cell in every living thing, by configuring the shape of a protein (Cooper et al. 2010). These shapes are important, because in the end they determine what function a protein has. For example, a protein that breaks down glucose for releasing energy, will have a shape that recognizes glucose and binds to it, much like a lock and key.

The first purpose of the game is to see whether human folders, that is us the players, are better in folding proteins than computers are. This is called “protein structure prediction” and the number of different ways even a small protein can fold is astronomical due to the many degrees of freedom. To figure out what the best structure is, concerns one of the hardest problems in biology. *Foldit* attempts to harness the puzzle solving intuition and competitive nature of human beings for this problem. Aside from the free labor, if it turns out that humans are better folders than computers, they aim to teach human strategies to computers so they can fold proteins faster.

The second purpose, and this is not pursued yet, is “protein design.” In that case, players will try to create proteins to disable a virus or scrub carbon dioxide from the atmosphere. This means that players are inventing solutions to help prevent or treat important diseases, like Alzheimer’s disease, cancer, or HIV/AIDS.

## ***To Conclude***

Many more domains can be thought of that use games, such as law, religion, art, energy & environment, transport & logistics, and ICT. Besides this, games can frequently be cross-categorized. For example, *Foldit* can be related to the domain of health and to science & education. The point to be made here is that every game is related to at least one type of domain, whether it is public policy or health. Recognizing this relationship is important, because each domain is affiliated with certain disciplines and people that need to be involved when developing a game. Based on the information from the domain and the scope and purpose of the game, a model of reality can be developed.



**Fig. 2.12** Solving puzzles by folding proteins in *Foldit*. Players need to optimize the structure by dragging the constituents of the protein or using any of the actions at the bottom. The “red balls” indicate a local suboptimal configuration. ©2008 University of Washington. Used with permission

The world of Reality involves more than just retrieving information, the “content”, and using this to develop a game. It also involves “dealing” with the real world. This dealing can be considered in two ways. First, it is about working with the different *stakeholders*. Depending on the business model and the type of game, a project may involve one or even more clients. It is not unlikely that these clients have different interests, opinions, and ideas about how they want to make use of the game. These deeper differences will be reflected in their suggested requirements and in their judgments of design documents and prototypes.

But also the subject-matter experts and the eventual users have to be considered. Aside from providing information to develop the game, these stakeholders can be used to judge the game as well. They will undoubtedly do so from a perspective which is very reality oriented. This can be noticed when they give comments like “this does not work like that in reality” or “the game looks nice but I am missing the stripes on the uniform of the game characters.”

Second, it is about considering the types of *criteria* that are relevant to this world. With “criteria” I refer to guidelines, rules, characteristics, or dimensions that the game must satisfy in order to be called a “good game.” From the world of Reality the criteria “flexibility,” “fidelity,” and “validity” can be retrieved. The extent to which these criteria are important depends on each individual project and the choices the designers have made throughout the process. It also depends on the consideration of the other two worlds.

## The World of Meaning

What does the world of Meaning “mean”? This seems a rather silly question but I can assert that this world is everything but self-explanatory. Let us first take its opposite: can a game be “meaningless”? The answer is a clear “no.” Any game, from small to big, from bad to good, has meaning. Of course, players may neglect partly the game’s meaning and just play it to spend their time, but the game itself is undeniably full of “signs.” First, it contains signs of what the game is about (is it in the past or the future?) and what players need to do (shoot enemies or solve puzzles?).

Second, many of these signs can relate to reality (whether fiction or non-fiction) as I just explained with the world of Reality. Moreover, games could have an underlying message, such as a moral or a criticism on the real world, that the players can take “home.” Sadly, most entertainment games do not even surpass the average children’s book when it comes to this. At most times it is something like “we have the good and bad guys and the good guys should defeat the bad guys.”

But there is something more to (even entertainment) games than we might think. My favorite example of a possible underlying message that is not as obvious at first, concerns an analysis by Bogost (2007) of *Grand Theft Auto: San Andreas* in which a player plays the role of a gangster called CJ (Fig. 2.17):

Whereas previous iterations of the [*Grand Theft Auto*] series favored stylized representations of historico-fictional times and places, *San Andreas* takes on a cultural moment steeped deeply in racial and economic politics...[in the game] the player-character must eat to maintain his stamina and strength. However, the only nourishment in the game comes from fast food restaurants...Eating moderately maintains energy, but eating high-fat-content increases CJ’s weight, and fat gangsters cannot run or fight very effectively. Each food item in the game comes at a cost, and the player’s funds are limited. Mirroring real fast food restaurants, less fattening foods like salad cost more than high-calorie super-meals... The dietary features of *San Andreas* are rudimentary, but the fact that the player must feed his character to continue playing does draw attention to the limited material conditions the game provides for satisfying that need, subtly exposing the fact that problems of obesity and malnutrition in poor communities can partly be attributed to the relative ease and affordability of fast food. (pp. 113–114)

This representation of the world leaves the player with two possible meanings. Either, as Bogost (2007) suggests, *San Andreas* exposes “the social forces that drive the poor and working-class residents of the inner city to consume fast food habitually” (p. 115), or it seems to be a “textbook example of moral strength” as it allows “the player to overcome the social conditions of poverty and poor nutrition through hard work” (p. 116).<sup>10</sup> Whatever meaning players attribute, they “might leave the game and make new observations about the world around them” (p. 116). Therefore, even *Grand Theft Auto*, one of the most criticized game series, can be considered “meaningful” beyond the context of the game itself.

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<sup>10</sup>The “hard work” that players have to perform in *San Andreas* relates to going to the gym and performing violent crime. The gym leads directly to more stamina and strength. Crime leads to money which can be used to buy the more “healthful” but more expensive salad meals at the restaurants.

However, as Bogost (2007) also outlines, it is unsure whether the game designers intended this or not. This brings me to the third possible meaning production of signs in games: meaning is in “the eye of the beholder.” With this I mean that players attribute meaning to the signs based on their own perception, ideas, and experiences. To one player the burger symbol in *San Andreas* could represent a symbol for “food in general” whereas another could see a social critique of society. And some people really do attribute the most fascinating and intellectually challenging meanings to certain games. Look at Murray’s interpretation (1997) of *Tetris* (Fig. 2.19):

*Tetris* is the perfect enactment of the overtasked lives of Americans in the 1990s—of the constant bombardment of tasks that demand our attention and that we must somehow fit into our overcrowded schedules and clear off our desks in order to make room for the next onslaught. (pp. 143–144)

It is obvious that we cannot expect that every single person would make such an interpretation. It is even very unlikely that the original designers, Alexey Pajitnov, Dmitry Pavlovsky, and Vadim Gerasimov, who created *Tetris*, had this idea in mind, because they created it between 1984 and 1986 and are Russian. Murray’s interpretation relates to her own world but is nevertheless perfectly acceptable. The point is that sometimes the meaning that people attribute to games is not necessarily intended by the designers.

In sum, meaning can be looked at in different ways, as in what the game is, to what it relates, and how the player relates to it. These meanings—which are present in any type of game—can affect player’s lives. Even in situations when the underlying message is difficult to retrieve, such as in *San Andreas*, player’s behavior may *unconsciously* be altered. Therefore, games in general, like other media (McLuhan 1964), can have a profound effect on society at large in, for instance, our attitudes and ways of thinking and acting (Beck and Wade 2004), and can be seen as cultural expressions in their own right which make us think about the world around us (Jones 2008).

Now consider games with a non-entertainment purpose. They are intentionally designed to create a meaningful effect beyond the game experience, something that is useful in the real world. Some sort of *value* needs to be achieved and at best this value is measurable. Aside that this requires to understand how “meaning” can be created by playing games, more carefulness and consideration is needed to consider meaning to ensure that the intended value is achieved.

Similar to the discussion of the domains, I will give an overview from the world of Meaning by discussing the types of values that can be pursued when using games. I first highlight values that are aimed at the player. To distinguish these, I use an often applied distinction in knowledge, skills, and attitudes (Wickens et al. 2004).<sup>11</sup>

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<sup>11</sup>The distinction of knowledge, skills, and attitudes (KSA) is slightly related to the frequently referred to Bloom’s taxonomy (Bloom et al. 1964) which distinguishes a cognitive, psychomotoric, and affective domain in setting educational objectives. KSA departs from Bloom’s taxonomy in two ways: skills can be either cognitive (social skills) or psychomotoric (physical skills), and knowledge is a subcategory within the cognitive domain. KSA is sometimes also referred to as knowledge, skills, and abilities which to me seems awkward because I think skills and abilities are similar to each other.

After these, four types of values are discussed that are not aimed at the player but at something else.

## ***Knowledge***

“What is knowledge?” and “how do we acquire knowledge?” are just some of the questions that an important branch of philosophy called “epistemology” is devoted to in answering for already quite some time. Answers relate partly to how we see the world. Does truth exist or is that what we “believe” is true, is what we need to call “truth”? Whatever is “true,” our society is without doubt a knowledge society in which people have to learn “things”—whether they are based on actual truths or beliefs. This learning is partly about acquiring knowledge (the other concerns “skills”).

Some have equated knowledge to “information” and “data,” but it is nowadays generally believed that we should separate knowledge into explicit knowledge on the one hand, and implicit knowledge on the other hand (cf., Dienes and Perner 1999). Explicit (or declarative) knowledge can roughly be considered similar to information. It is what we can make known to others and of what we are conscious about. It can be subdivided into semantic and episodic knowledge. Semantic knowledge is concerned with facts, ideas, understandings, and concepts which are not related to personal experiences, like “Sonic the Hedgehog is a game character.” By contrast, episodic knowledge involves events of personal relevance. A memory of where, when, and with whom I played *Pac-Man* the last time is a form of episodic knowledge.

Implicit (or tacit or procedural) knowledge covers the informal and hard to define aspects.<sup>12</sup> People are frequently not aware of this latter knowledge and are unable to verbalize it if they do. The most well-known example concerns grammar. We do not know why and what for, but we just know *how* to apply it. An example with games would be asking a player how he or she is beating other players who then responds something like “I just practice a lot.”

People acquire these types of knowledge in different ways: reading, listening, imitating, or simply on the basis of experience. A wide variety of theories, methods, and tools are applied to make sure people acquire knowledge as efficiently and effectively as possible in our knowledge society. Games can be seen as such a method or tool. Affordances of games, such as that they are motivational, experiential, situational amongst many others (cf., Gee 2004; De Caluwé et al. 2008), are reasons

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<sup>12</sup>Here I do not make a difference between implicit and tacit knowledge. However, it needs to be kept in mind that often the first is seen as all the information that has not been articulated, while the latter is considered to be information that cannot be articulated. I also do not make a difference between implicit and procedural knowledge. However, similar to tacit knowledge, procedural knowledge also cannot be articulated. It is further much more concerned with “knowing how” and in this way it is closely affiliated with the concept of skills, while implicit knowledge covers aspects as conditioned responses and reflexes as well.



**Fig. 2.13** Persuading a Soviet officer by quoting Karl Marx in *FF56!*. ©2006 Lauer Learning. Used with permission

why teachers and trainers consider games.<sup>13</sup> In fact, games have been used for already quite some time to provide people knowledge. In this context, they are often referred to as “educational games,” or “training games.”

To illustrate the use of games for providing explicit knowledge, let us have a look at *FF56!* (Fig. 2.13). This game blends rich, historically-accurate narrative with first person gaming. Players are dropped into the streets of Budapest during the revolution period of 1956. They have to struggle alongside characters that fight for Hungary’s freedom. The game offers a mix of fictive and real experiences based on actual events and personal accounts from people who experienced the revolution.

By getting immersed into this specific historical situation, in which players have to deliver medical supplies, rescue the wounded, battle soviet soldiers and the dreaded secret police, gather items, and wrestle with moral dilemmas, players get an understanding of what happened during that pivotal moment. By experiencing it themselves episodic knowledge of playing the game gets supplemented with semantic knowledge of historical facts.

<sup>13</sup>In my view, games are specifically good in providing for “system knowledge.” This subtype of explicit knowledge is about “knowing the big picture.” As games are systems, they enable to understand how the little pieces of a “system” fit together, over time and under different circumstances. It is about seeing the overall structures, patterns, and cycles, rather than seeing only specific events. A system can be anything, from a human body (how does the heart respond to different medicines?) to an economic market (what strategy will make our company survive in the longer term?).



For providing implicit knowledge much less is known when it comes to using games. However, it can be hypothesized that games are very good tools in doing this. Although implicit, acquiring this knowledge includes or starts with acquiring explicit knowledge. When we learned grammar, we also had to learn words and certain rules of how these words need to be combined to make up a sensible sentence. For example, we had to learn that IF “he” or “she” is used as a pronoun THEN a “s” needs to be added to most but not all verbs. Now we apply this rule without thinking about it.

In games, this “proceduralization,” learning such IF-THEN-DO constructions, happens all the time. At first it requires conscious effort on behalf of the player—IF I press SHIFT, THEN I will fire—but quickly, after some rehearsal this becomes a habit, a response: IF an enemy is observed, THEN I will automatically press SHIFT. With games, like *Supervisor*, it could happen that players slowly but unmistakably get implicit knowledge of what to do when they encounter subtle cues that indicate that a possible problem is about to occur. Therefore, games seem to allow for the creation of such knowledge, which according to Anderson (1983, 1993, 1995) is needed for becoming an expert at something.

## ***Skills***

Generally, knowledge is regarded as something that is learned, while skills are the abilities to apply what is learned. It is quite difficult to separate the two, especially because in practice they are used and needed at the same time.<sup>14</sup> The difference can nevertheless be clarified by hypothesizing what would happen if somebody is skillful but not knowledgeable (enough). In that case a person might be very good in performing some action but when the situation changes this person is unable to cope with it and quite likely makes a mistake. This is often the case with airplane accidents in which pilots automatically perform actions, whereas they should have acted otherwise.

The other way around, if someone is knowledgeable but not skillful is when we “know” how to do it but still cannot manage to actually do it in practice. We may know how to score a goal in sports, how to make a Windsor knot with our tie, or how to drive a car, but still have difficulty, at least at first, to actually put this to practice. For this, skills are needed.

The latter points out another difference. We know something or not, but skills can be endlessly refined. We can continuously improve how to score a goal, how to tie a

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<sup>14</sup>Besides knowledge, skills, and attitudes another term that is frequently applied, especially in the field of Human Resource Management (HRM), is “competences.” Some say competences include knowledge and skills, others add also attitudes to it. The term is generally used to indicate requirements that people need to have to perform a job. Although this term nicely integrates aspects that on many occasions are linked to each other, I prefer to use the separate terms, because clearly some games are more aimed at knowledge, while others are more aimed at skills and attitudes. By using the separate terms, these differences in emphasis become clear.



Windsor knot, or drive our car, and so on. Of course, we can improve our knowledge as well yet this would mean we have more information, explicit or implicit, about something, whereas with skills we have gained or strengthened certain abilities.

As for the types of skills, similar to knowledge they can be classified in innumerable different ways. Aside from the more specific task-dependent types of skills, four generic types of skills can be separated:

- **Cognitive skills:** these refer to the “intellectual” abilities that make it possible for us “to know.” In other words, when teaching cognitive skills it is about learning how to learn. They relate, for example, to reasoning, memorization, planning, and interpretation.
- **Perceptual skills:** relates to the five senses of sight, hearing, touch, smell, and taste. Improving our skills means being able to distinguish stimuli better by means of one or more of these senses.
- **Motor skills:** movements, such as lifting one’s hand, sitting up, crawling, require—how trivial they may seem now—practice and skill too. Most often we need to use our perception as well when performing movements, like in many hand-eye coordination tasks such as grabbing a piece of candy from a jar. When this is the case, we should speak of “perceptual-motor skills.”
- **Social skills:** human beings are social creatures and some are better at dealing with other humans than others. The skills to do so, such as collaboration, communication, and negotiation, are what these skills include. This is often also referred to as “interpersonal skills.”

Each type of skill can be related to games. In fact, it requires already perceptual-motor skills to use controllers, the keyboard and mouse, or other devices that are needed to play a game. Subsequently, it requires cognitive skills to understand what the goal of the game is and determine what to do. And when it is a multiplayer game, social skills come into play as well. By actually playing a game it is very likely that all of the above-mentioned skills are practiced.

The point for non-entertainment games is how this tool can be harnessed to train a specific skill. It is one thing that games require skill to be played and yet another to play a game to practice a skill that is useful beyond the context of the game. *Tempo Typen*, the old Dutch game to learn the motor skill of how to type, is an example of this (see Level 1). Other examples concern games in which real equipment is connected to a game environment, such as what is being done to train surgeons with laparoscopic equipment and pilots with an airplane dashboard (Bergeron 2006). By using the equipment surgeons and pilots get a feel for it or in other words, they get the needed perceptual-motor skills to use the equipment.

A nice example of training cognitive skills concerns the use of games to train air traffic controllers (Wald 2008). These professionals need to prioritize—according to the available slot availability—airplanes which can be simulated in a game-like environment.

As for social skills, I would like to highlight *Virtual Leader* (Fig. 2.14). In this game, players can practice different leadership styles, such as directing, participating, and delegating (Aldrich 2004). To practice these, they enter several meetings



**Fig. 2.14** Acting as a leader in *Virtual Leader*. ©2003 Simulearn. Used with permission

which are set in different settings and have a different purpose. Players can introduce, support, or object ideas and can talk to characters by clicking on a slide bar whether they want to react negatively, neutrally, or positively toward somebody. The game characters can also introduce, support, or object ideas and one of the main aspects of the game is to understand the intent of these game characters by observing their body language and interpreting their words.

*Virtual Leader* and many other games show that games can be used to “practice” skills. For this reason, these types of games are sometimes referred to as “practice-ware,” although the more common label of training or educational games can be applied to these games as well.

## *Attitude*

Attitude is a person’s “learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object” (Fishbein and Ajzen 1975, p. 11). This object can be another person, a product, event, or basically anything else which we could like, dislike, or be ambivalent to. Objects can be tangible and specific, such as the Playstation 3 or Super Mario, or be abstract and intangible, like socialism and computer science. When we judge these objects, we have, implicitly or explicitly, an attitude or “orientation” to these objects.

Quite often, especially if the object is important to a person, judgments are based on feelings and emotions besides the beliefs that one has about the object. Players

may like Nintendo, because their first console was a Nintendo and they have fond memories of it, or dislike it because a majority of their games are simply not the type of games they want to play. It is generally believed that attitudes shape people's behavior: a person with a dislike for Nintendo will not buy Nintendo products.

The whole idea of marketing, advertising, and recruitment by companies, politicians, foundations, and others is to make sure people's attitudes judge their "objects," whether a product, service, performance, or something else, positively. And unlike personality, attitudes can change. This can be done on the basis of experience—actually playing some Nintendo games seems to be rather fun—on the basis of communication—Nintendo's new campaign gives it a new "innovative look" that changes people's minds about the company or of playing games in general (cf., Juul 2009).

The great thing about games is that they can provide both at the same time: games are experiential expressive media. Moreover, games tap into the feelings and emotions of players, because playing a game is not without any (e.g., think about winning, losing, or the frustration of not solving a puzzle). This makes them a powerful tool to "persuade" people.

Bogost (2007) argues that games persuade people by means of *procedural rhetoric*. This is "the art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images, or moving pictures" (p. ix). By seeing how the dynamics of the game world unfolds, players not only experience what happens but also get a message that may influence their attitude to a given object. How this works can be seen in the simple procedural rhetoric of *September 12th* (Fig. 2.1). The way the message of this game is presented to the player is "computational"—not in words but in interacting with a rule-based representation.

Not all games aimed at attitude change apply procedural rhetoric as *September 12th* does. Many games only wrap a theme or visuals around existing game mechanics. I consider this "graphical rhetoric."<sup>15</sup> Look at the Burger King games. Instead of offering the usual toys, this fast food chain started to sell on November 19, 2006, three games that featured their own mascot. One game called *Pocketbike Racer* involves pocketbike racing, another called *Big Bumpin'* bumper-car riding, and the third called *Sneak King* concerns a stealth game in which players have to sneak up on hungry people to surprise them with Burger King food.

None of these games relate procedurally speaking to Burger King but graphically they do.<sup>16</sup> And although users and critics score all three of these games mediocre, the games can be considered successful.<sup>17</sup> On December 31, 2006, "Burger King

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<sup>15</sup>The term "graphical rhetoric" is based on the term "procedural rhetoric" and "graphical logic." The latter was used by Noah Wardrip-Fruin to refer to games that only wrap a theme or visuals around existing game mechanics (see Bogost 2007, p. 89).

<sup>16</sup>It could be argued that *Sneak King* does have procedural rhetoric. By sneaking up on hungry people and surprising them with Burger King food, the game says that when people are hungry, we should make them happy by bringing them to Burger King.

<sup>17</sup>I based the mediocre scores of the Burger King games on the meta-scores provided by Metacritic, see <http://www.metacritic.com>.

announced a whopping (pun intended) 40% increase in quarterly profit” (Edery and Mollick 2009, p. 33). Plus, “the games were not merely a one-time promotion like so many others in the fast-food industry; they were a Trojan horse into the home and make a long-term advantage over might competitors like McDonald’s.”

Even farther off from procedural rhetoric than graphical rhetoric is *in-game advertising*, such as Barack Obama’s Vote for Change advertisements in a number of entertainment games. Results show that even this seemingly minor persuasive effort of placing ads in games has positive effects on attitude change (Glass 2007).

Games aimed at attitude change are generally referred to as “persuasive games.”<sup>18</sup> When games are specifically used for advertising the term “advergaming” is commonly used and when they are specifically used for social change (such as the games by the UN or the Red Cross), the terms “social impact games” or “games for change” are applied.

## Assessment

Assessment is judging systematically the merit or worth of “something.” And what could be a better place to judge “something” in a “safe environment” that we call a game? The “somethings” that can be judged in games can relate to organizational structures, processes, tools, instruments, or even people. In job interviews it is not uncommon that people have to perform role-plays or do assignments, because in these sort of situations it can be seen how a person works in practice.

From this, it is a small step toward actual games. In fact, several recruitment agencies or even corporations are already experimenting with this. However, the notion of a “safe environment” becomes in this case a bit problematic. For the applicants the game and their performance in it really matters. If they do not perform well, they may not get the job. Looking at it from the side of the interviewer, however, it is much safer to judge people in a game than to hire the wrong person.

The same line of reasoning can be applied to games in which the performance of people are judged, such as in a game that simulates a crisis or of students whose grade is dependent on their game performance. I have heard quite often that people are unwilling to play a game, because of their status—think of mayors, CEOs, or even presidents—and fear that they may not do well. Students do not really have a choice but it is unlikely that they will enjoy the game as much as they would without

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<sup>18</sup>Bogost (2007) introduced “persuasive games” as a substitute to “serious games” or actually as a term that covers “serious games” as well as other types of games, because in his opinion the term serious games does not cover games that “speak past or against the fixed worldviews of institutions like governments or corporations” (p. 57). However, whether this is true or not, in my opinion not all games with a non-entertainment purpose are about “persuasion” in the first place which renders the term useless as an overarching concept. Take games aimed at “data collection” for example. But more importantly, in a strict sense persuasion is aimed at changing or influencing one’s beliefs or actions. In other words, it is aimed at “attitude change.” These games are thus only related to this value.

being judged. This use of games remains, therefore, a bit tricky but it is without a doubt a way to use them.

When it comes to judging the performance of students, another argument against assessment aside from safety concerns the relationship between learning and performance. While this seems axiomatic, according to many this relationship is weak or nonexistent (Washbush and Gosen 2001). Performance could be based on luck and if it is a multiplayer game, on the performance of other players. Additionally, since people learn from mistakes, it may be a good strategy in terms of learning to make mistakes. Therefore, learning and performance should not be equated to each other. However, as Washbush and Gosen explain, this does not mean we cannot judge people's performance in games:

In real-world organizations, managers and employees are continually evaluated on performance and rarely on learning. In the university, we usually grade on mastery or performance via test or paper after the completion of a unit rather than a change from one level of understanding, knowledge, or analytical ability to another. Grading on performance is what we usually do, and the caution suggested by these studies is only for those who want to grade on learning only. (pp. 292–293)

At least much less “scary,” although the work of many could be at stake, relates to the assessment of organizational structures, processes, tools, or instruments. These can be so to say “plugged into” a game environment and people can start to use them before they are actually used in the organization itself.

An example of such a game involves one which was my first encounter with the development and use of a game for a serious purpose (van Bueren et al. 2009). This was a computer-supported game which evolved around a new financial system that was about to be introduced to the Dutch courts. The players, consisting of court managers and administrative personnel, needed to produce budgets in a number of years for a fictional court. By looking at how players would deal with this new financial system, potential problems, perverse effects, and questions with this system could be dealt with in an early stage. This way, the official introduction of the system would go much more smoothly.

Although the use of assessment in games has some fundamental problems with being safe which need to be investigated further, it has a great potential. And if we think about it, it is not that much of a new or extraordinary application. The newest technologies are frequently applied in competition-like settings. Take for example the solar races in which university teams battle against each other in self-constructed cars that drive on solar energy or the RoboCup Challenge in which teams made up of robots play soccer against each other. Nevertheless, care should be taken when considering this value creation possibility.

## ***Data Collection***

With data collection the game is a means to get a certain output which is useful for other purposes. It should not be mistaken for data collection to “improve” the game.

This is something many game companies nowadays do and are able to thanks to the possibilities of the Internet. To apply for this value creation possibility, the collected data should be applied to something outside the game's context. The most simple means of such data gathering are personal statistics, like gender, age, and country of residence. Companies may want this information to see how they could market their products toward people and use a game to acquire this type of information.

Another but rather more sophisticated way of data collection through games concerns "human computation" (Von Ahn 2005). The whole idea behind this is that computers cannot perform the sort of cognitive tasks that humans can do, like recognizing pictures. At the same time, it can be seen that humans spend a major time on playing games. Luis von Ahn, one of the pioneers in this area, argues that while it took 7 million hours to build the Empire State Building and 20 million hours to build the Panama Canal, people spent 9 *billion* hours on playing *Solitaire* in 2003. This means that if it were possible to build both constructions through *Solitaire* the first would take 6.8 hours and the latter a day, respectively! For this reason, Von Ahn suggests to create games that make use of human brainpower "productively" by making sure that the game experience is useful beyond the game itself.

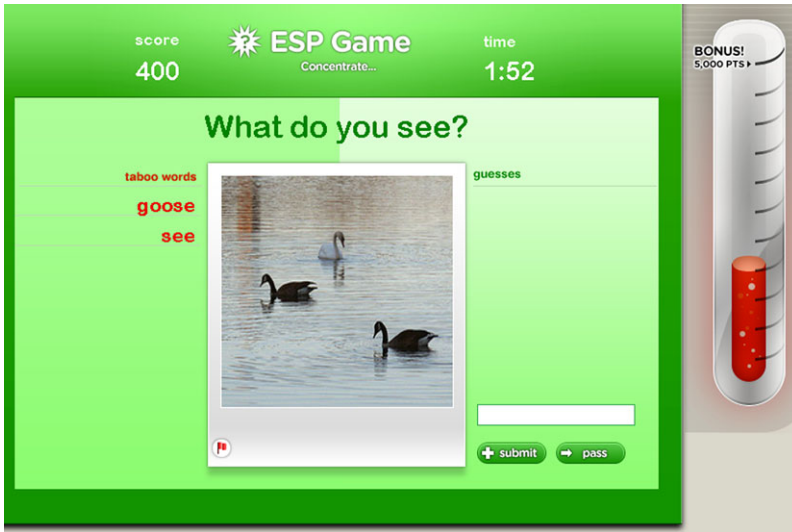
One of the games he designed to implement this vision is the *ESP Game* (Von Ahn and Dabbish 2004). In this game, two players try to reach as quickly as possible a common word that can be associated with a picture (Fig. 2.15). The faster they reach consensus, the more points they earn. The words players reached consensus about can subsequently be stored into a database. This way, search algorithms, like Google uses and which cannot recognize pictures, can make use of the "tags" that people have given to pictures and give more refined feedback to users. According to Von Ahn it is possible to label every image on the Web if only 5,000 people are playing this game for a month. At the moment, many have played the game for over 20 hours a week, and over 20 million image labels have been harvested (Edery and Mollick 2009). This is the equivalent of several million euros of free labor. The earlier mentioned *Foldit* is another example of a game used for human computation (Fig. 2.12).<sup>19</sup>

## Exploration

In workshop settings professionals sometimes get together to construct a scenario or simply brainstorm about all kinds of possibilities without having a clear idea upfront. And in research, it is not uncommon that researchers step into or create some environment and just see what happens. In all of these instances people attempt to "explore" a certain topic. This idea can be applied in a game setting as well. A game can be setup with a number of initial conditions and at the end it can be observed what the outcomes are. By comparing different sessions with similar and different conditions a topic can said to be explored within the limitations and context of the game.

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<sup>19</sup>For more examples of "human computation" games, see <http://www.gwap.com>.



**Fig. 2.15** Tagging pictures collaboratively in the *ESP Game*. ©2004 Carnegie Mellon University. Used with permission

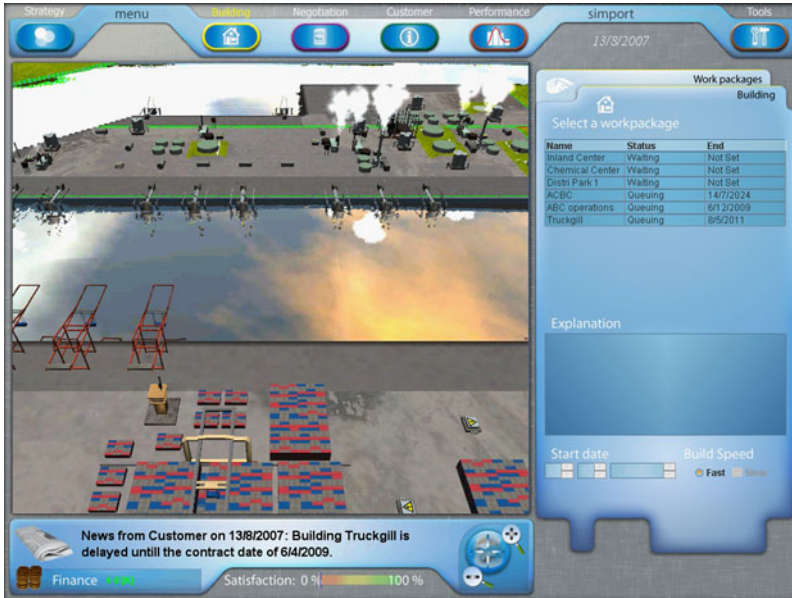
The value of using games in this way is similar to and based on other forecasting techniques, such as scenario writing and hardcore simulation models (Mayer 2009). But the use of games should not only be seen as diagnostic tool to predict the future (Greenblat 1980). They can also be employed to understand and explore how historical settings or current patterns have emerged under different circumstances, for example, when it comes to the development of cities (Portugali 2000).

The example of a game to explain this value concerns, however, one that focuses on the future. In the Netherlands, the Rotterdam harbor is considered one of the biggest in the world. The government has nevertheless decided to enlarge this harbor to keep up with the economic demands and growth of the rest of the world, and as a matter of fact, they are creating this extension as I am writing these words. To simulate the construction and exploitation of this extension, a game was created called *SimPort-MV2* (Fig. 2.16).

In this game, players have to setup a strategy to construct and exploit this extension. After devising within certain limitations the layout of the extension by appointing industries to locations and setting up a time schedule for construction, they have to allocate clients to the locations within the harbor. At the end of the game, when the time line hits the year 2037, a certain spatial arrangement is achieved with certain costs, profits, and other important indicators to base a score on.

For the players, playing the game allows for understanding the complexity involved with the process of constructing and exploiting a harbor and getting an understanding of what strategies need to be followed to manage it effectively. This is the educational side of the tool. As for the output, the various spatial arrangements and other indicators, they can be examined after a few runs to see if patterns can be recognized.





**Fig. 2.16** Building and exploiting a harbor extension in *SimPort-MV2*. ©2006 Tygron Serious Gaming. Used with permission

This is exactly what Bekebrede (2010) has done. She also used different initial conditions, such as whether the game starts with a bad or strong economy which has influences on how clients negotiate contracts with the port authority, to see how this affects the eventual results. This way, by means of a game as an exploratory tool, the construction and exploitation of a harbor extension can be *explored* under different circumstances and by simulating stakeholders in interaction with a physical system.

Using games for exploration has been especially limited for now to public policy and in particularly to urban planning (for other examples, see Mayer et al. 2004, 2005), but its use remains a possibility to pursue for many other domains and with the experiences of these pioneers, it could be “explored” a little bit further.

## Theory Testing

In contrast to exploration, games could also be used when people have a clear idea upfront. In this case they would like to “test” if their preconceived notions, based on theories, assumptions, or anything else, hold ground.<sup>20</sup> The game becomes a sort of “laboratory experiment” in which researchers “play” with variables. With tests, it

<sup>20</sup>Scientifically speaking, this distinction can be seen as an inductive approach when it comes to exploration and a deductive approach when it comes to theory.

can, for example, be seen under which circumstances people perform better or how people start to organize themselves given a set of conditions. When a game is repeated sufficiently, the outcomes of sessions (based on criteria set by the researcher) can be used as valuable data to accept or reject a hypothesis.

For instance, the hypothesis of whether gender has an influence on leadership style could be tested by examining the performance of males and females while they play *Virtual Leader*. While in this situation an existing game is repurposed, examples are known in which a game was built from the beginning to test a theory (cf., Meijer 2009).

This idea of using games for theory testing is certainly not new (Brewer 1978; Duke 1974; Gibbs 1974). It simply has not found any common ground because of a number of methodological issues (see also Klabbers 2006). First, we have the problem of validity. Does the game really replicate reality and are we able to generalize to reality? Whatever researchers attempt, this always remains open for debate.

Second, we have the problem of control which is essential to perform experiments. Games are dynamic and open to inventions by players, especially if it concerns a multiplayer game. This means researchers have to control many variables at the same time. Also, it can be expected that every game session is at least somewhat different, which makes it hard to compare.

Third, applying games is in many cases practically cumbersome. It requires a lot of effort to first design a good game and subsequently to setup the experiments. This and more explains why most scholars refrain (so far) from using games to test theories.

To give an example of researchers who did not refrain from this, let us take a look at an analog multiplayer game called the *Mango Chain Game* (Meijer 2009; Zúñiga-Arias et al. 2006). The game is played around a board that represents the mango production and export chain in Costa Rica, one of the countries that exports the mango fruit. Mangoes of different quality are represented as fiches that are harvested by the producers and sold to either multinationals or independent exporters, who on their turn, sell it to retailers. The production, transportation as well as the consumer market is simulated, the rest occurs on the basis of contracts between participants. When a contract is signed, this is represented as a colored elastic band between participants on the board. Colors indicate the duration of the contract.

At first, the researchers hypothesized that because of the low bargaining power of the producer associations and the risk averse nature of people, local farmers with whom they actually played the game with would opt for long-term contracts with its associated higher prices. However, it turned out that mango producers rather have short-term contracts. This gives them the opportunity to remain flexible in responding to changes in the supply they cannot control. In the longer run, farmers may not get the higher prices that come with long-term contracts, but they do not have to disappoint buyers because of bad harvests.

The findings of the study may well have been found by other means of research but the point is that gaming can be seen as another tool by which it becomes possible to research and test theories. It could be used as an environment to further validate observations or as an experiment in and of itself. Moreover, simple game-like fea-

tures, such as time-pressure, scores, and aesthetics, can be used to “dress up” experiments. One experiment already used the faces of Bert and Ernie from “Sesame Street” to engage young children in an otherwise boring two-choice key-pressing task (Kray et al. 2006). From this, it is a small step to actually use games.

## ***To Conclude***

Similar to the world of Reality, the categorizations of this world are exemplary and can also be cross-categorized. In fact, many games will probably already tap into two or more values or could be easily repurposed for other types of values. What needs to be kept in mind is what the primary purpose of the game is. This should be leading in thinking of what value needs to be achieved and in what manner.

In thinking about his, disciplines such as psychology, semiotics, instructional technology, communication studies, rhetoric, and the learning sciences in general, can be helpful and need to be involved. They provide theories, frameworks, and best practices that give direction to how values can be achieved. This part of the development is related to a world that I call “Meaning” and results in a *value proposal*, an extensive description of how a game will impact the real world.

While the world of Reality is related to the stakeholders, this world is affiliated with teachers, storytellers, data mining experts, researchers, or any other “professionals” that have expertise on how to accomplish some value. Although it is certainly not a common practice, it is important to involve such professionals. What type depends of course entirely on the value that needs to be reached. Stereotypical responses of people from this world include “that is not how the point gets across” or “yes, adding flowers to the wall will make the environment definitely more attractive but it will also distract the player.”

The world of Meaning is different from Reality. It focuses on the type of value, whether knowledge or data collection, that needs to be achieved and considers this from a whole set of different disciplines and criteria. The criteria part of this world concern, for example, “motivation,” “relevance,” and “transfer.” It also requires to deal with other people, those that know how to create a certain value. Nevertheless, this world needs to be reconciled with Reality, for they are interdependent on each other: without Reality there is nothing to base a game on and apply the eventual meaning to. Both are also interdependent with another world, one that I will discuss right now.

## **The World of Play**

Ask a random person about what a game is and expect to receive random responses. A typical family guy would refer to the cozy times at home of playing *Monopoly*, an intellectual would talk about the great victories at simultaneous *Chess* championships, an athlete would non-stop explain the strategies of his or her favorite types

of sports, and a digital native would converse in a for “normal” people incomprehensible manner about the ins and outs of *World of Warcraft*. Games can clearly be found in different shapes, settings, and cultures.

Finding a definition of “a game” is due to this huge diversity quite difficult (Schell 2008; Salen and Zimmerman 2004). In general, however, games are differentiated from “play” by having clear goals and rules. The much more open-ended and free-form type of activities we coin “play,” such as *Doctor & Nurse*, also have rules, but these are much less emphasized and rigid compared to games. In *Doctor & Nurse*, for example, the only rule is to behave like a doctor and nurse. That is it. And there is not really any goal in playing it.

Contrast this with *Poker*. In *Poker* every step is dictated by the rules. Not for nothing they came up with the expression “The cards do not lie.” It is not the player who determines the outcomes, it is the “rules of the game.” The player can only influence the outcomes by manipulating the rules. *Poker* also has a very clear goal. Players win a round when they have the best cards or if their opponents do not dare to compete with them. In the end, the player with the most fiches wins.

Thus, games can be distinguished from the larger concept we call “play” by looking whether it is an activity with goals and rules or whether it is an open-ended and free-form type of activity. This makes games basically a formalized type of play. Although this sounds as if games can be clearly separated from play, in reality this is not always the case. In between *Doctor & Nurse* and *Poker* there are many activities, some which are closer to *Doctor & Nurse* and others which are closer to *Poker*. In fact, many people interchange play with games, probably because the boundary between what is considered a game and what a play is just extremely vague. The confusion rises even higher in other languages than English, since in for example Dutch and German, the word for game and play is identical (i.e., this is “spel” and “spiele,” respectively).

For this reason it is better to look at games or other play activities as existing on a sliding scale, a continuum, of being unregulated or having strict rules. Even many more dimensions can be thought of, if we for example want to differentiate “a game of chance,” which is structured but does not involve any player effort, like flipping a coin, from “real” games, those that are structured and do require an effort by the player (cf., Caillois 1958/1961; Juul 2005). Nevertheless, I conceive of all these dimensions and their related activities to be part of the “world of Play,” especially since real games can contain parts that are mere luck, take for example the throwing of dice in *Monopoly*, and can include some free-form and open-endedness. The latter can, for example, be seen with *SimCity*.

This world of Play needs to be considered if people want to design a game. To develop a game, designers need to come up with a *game concept* which is a detailed idea of what the game is like. It describes what elements are part of it and how they relate to each other in creating an experience. One of the first things designers do is to think of what type of game they are going to design. Although a huge variety of games exist, games can be classified similar to movies and books into certain *genres*.

Not surprisingly, little agreement exist on these genres (Foster and Mishra 2009). One important general tendency can however be noticed: the categories of games

are not based on the content, as with books or movies, but are based on the type of challenges (Rollings and Morris 2004). A game with a science fiction theme is not a science fiction game, but is an action, strategy or role-playing game, depending on which type of challenges the game has. Take (again) *The Matrix* movie.<sup>21</sup> Cinematologists would consider this movie to be a science fiction movie, while gamers consider the *Enter the Matrix* game, which is based on the movie, to be an action game, since it involves fighting, button-smashing, and all the other characteristics that make up an average action game.

With this in mind, from my (subjective) point of view I conceive of seven “big” genres: action, adventure, puzzle, role-playing, simulation, strategy, and virtual world games. To provide a perspective onto games with a serious purpose from this world, below a short description of each genre is given. These descriptions are largely based on the work of Rollings and Adams (2003).<sup>22</sup>

## Action

Precision, timing, hand-eye coordination, and button-pushing are important aspects of *action* games. For this reason, action games are also referred to as *twitch games*. They tend to be simpler than most other types because there is only so much information and complexity that the average brain can interpret in unit time. Consequently, they do not have a long learning curve. The player just needs to know the right buttons and that is it. If a player asks “Where is the fire-button?” or something similar, then it is obvious that we are dealing with an action game. Other characteristics of action games are:

- **Twitch-speed:** action games are fast-paced. When players forget to pay attention, it is too late, and they have to start over again.
- **Levels:** a level is a specifically defined area in the game arena, in which the objective for the player is to complete a specific task. Action games tend to consist of multiple levels and upon completion the player can go to the next level. Generally, the difficulty will increase with each subsequent level.
- **Lives & energy:** the player gets usually a number of tries to finish the level, or even the game. In some cases the life of a player is depicted with energy. If the amount of energy is depleted, the player loses a life. Lives and energy can be earned in some games by collecting power-ups, game elements that reward the player, or by getting high scores.

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<sup>21</sup>*The Matrix* is produced by Joel Silver and directed and written by Larry and Andy Wachowski. It was distributed by Warner Bros. Pictures in 1999.

<sup>22</sup>Compared to the classification by Rollings and Adams (2003) I have made some adjustments. Some genres I conceived of subgenres, like vehicle simulations, and others I conceived as half-breeds, genres that fall between two other genres, such as sports simulations (action and simulation). More information about each of the genres can further be found in their book. I simply made a synopsis of the elements I thought to be most characteristic.

- **Time:** some games have a timer that indicates how much time is left for the player to finish a particular level. When it reaches zero, a major event occurs, such as a levee breach, and the player might need to restart the level. Time is sometimes also used to get a bonus when finishing the level very quickly. Whether a timer is present or not, in every action game time is a critical element. The player needs to accurately and timely respond to events, otherwise it is game over.
- **Score:** a score is an indicator of progress and action games are pretty much centered around it. Most action games have high score tables letting the best players show off to other players.

The designation “action game” covers a wide range of game styles. They do not necessarily involve shooting or fighting. They can be very kids friendly, as in *Super Mario* or *Sonic the Hedgehog*. Subcategories involve “beat ’em ups,” “shoot ’em ups,” and “platformers.” All three of them pretty much speak for themselves: beat ’em ups are about fighting, shoot ’em ups about shooting, and platformers about jumping from platform to platform. Other examples of this genre are *Unreal Tournament* and *Grand Theft Auto* (Fig. 2.17).

## Adventure

For *adventures*, the story is central to the whole game. The player has to explore the game world and in the meantime accomplish particular tasks to get to know more about the story. The particular tasks between the storylines can be anything, from collecting and manipulating items, puzzle solving to some combat and action elements, although most adventures have a reduced emphasis on the latter. From a design perspective, the tasks in adventures can be referred to as “mini-games”: little games within a game. Not every adventure uses this mini-game approach, some have a very consistent type of task throughout the whole game. The best adventures, such as the *Monkey Island* series make these mini-games fit within the setting and story (Fig. 2.18). The characteristics of adventure games can be summarized as:

- **Story-based:** the story is central to adventure games. Conversations, drama, emotions, humor and other things that make up good narratives should be part of an adventure game.
- **Setting:** the setting in an adventure game contributes more to its entertainment value than in any other genre. The setting creates the world the player is going to explore and to live in, and it is for many players the reason for playing adventure games in the first place.
- **Mini-game approach:** the interactive parts between the stories take a mini-game approach. The player gets different challenges across his path, from decoding a cryptic message, collecting items, doing detective work to (insult) sword fighting.
- **Context-sensitive perspective:** since a lot of things in current adventure games is prescribed, most use a context-sensitive perspective. This means that the camera angle changes in each location to a position that would enhance the story or gameplay.





**Fig. 2.17** Eating pizza after some action in *Grand Theft Auto: San Andreas* at “The Well Stacked Pizza Co.” Other restaurants in this game are “Burger Shot” and “Cluckin’ Bell.” CJ stands in the middle with his brand new hair cut and sneakers. ©2004 Rockstar Games. Used with permission

- **Point-and-Click:** most adventures use a point-and-click user interface. With this interface, the player only needs to use the mouse to play the game. The player just points to objects in the screen with the cursor, for example a door or character, and then clicks on the object in order to open the door or to talk to the character.
- **Dying?:** in most adventure games the player cannot die. They are about exploring and not about fighting, so there is not anything that could really kill the player’s character. Those adventures in which players can die use ways to inform them very clearly that doing something would kill their character. For instance, if a dragon is in a cave, the designers litter the entrance with bones of earlier adventurers.

Adventure games, like *Zork*, were highly popular in the early days of the computer when graphics did not play a big role. Nowadays the genre gets less attention, but it is a misconception to think that this genre is “dead.” Other than *Monkey Island*, *Myst* and *Grim Fandango* belong to this category.

## ***Puzzle***

Many games, especially adventures, contain *puzzle* solving. While using puzzle elements, they are not primarily about puzzles. Puzzle games on the other hand are.





**Fig. 2.18** Finding adventure in *The Tales of Monkey Island*. The player on the right is conversing with a game character to get a ship. ©2009 Telltale. Used with permission

Quite often these games do not incorporate these puzzles into a storyline or larger goal. The player simply solves puzzle after puzzle until all the puzzles are solved. A puzzle game can be quickly identified when it involves only one screen in which the action takes place. For this reason, they can be considered more static than any of the other categories. Characteristics of puzzle games are:

- **Puzzles!:** well, it is obvious that logical challenges are central in these type of games.
- **Simple rules:** the rules of puzzle games are straightforward and simple. “Get to the exit” or “Get rid of all the balloons” are very clear statements with which the player has to achieve the goal of the game.
- **No story or higher goal:** most puzzle games do not have a story or higher goal. If they do, it is most of the times completely irrelevant. For example, players save the princess after solving ten puzzles in which they have to find an exit in a maze.
- **Single screen:** all the action takes place in a single screen.

Although these type of games do not show off the most powerful graphics, they do belong among the most frequently played games. Who has not played *Solitaire* in his or her life? Other puzzle games are *Tetris* (Fig. 2.19) and one of my favorite games all time, *Puzzle Bobble*.

## ***Role-Play***

*Role-playing* games are derived from pen-and-paper games, such as *Dungeons & Dragons*, and Live Action Role-Playing (LARP) games, and are pretty complex. To distinguish role-playing computer games from their non-computerized forms, they are referred to as “Computer Role-Playing Games” (CRPGs). Characters are central in role-playing games. The player plays one, but frequently more than one character, and during the game these characters evolve. They get stronger and get more abilities. The progress of characters is tracked with “experience points” or some other type of accounting system. The story is, similar to adventures, an important aspect of a role-playing game. However, in general CRPGs can be distinguished from adventures in that they incorporate more action and less story.

- **Configurable characters:** CRPGs are centered around characters that can be configured by players during the game. In some CRPGs players only play one character, in others they can play multiple characters.
- **Story and action:** CRPGs use many action elements, but also use a lot of story elements. Some emphasize one more than the other, but compared to action games they have less action and compared to adventure games they have less story.
- **Fantasy or science fiction setting:** they are frequently set in some Tolkien-esque fantasy or Star Wars-esque science fiction setting.
- **Experience points:** players can gather experience points (or use another accounting system) for their characters to make them stronger or give them new abilities.
- **Inventory:** players carry around all kinds of items, such as potions, weapons and gifts, that they can use throughout the game.

Although Massively Online Role-Playing Games (MMORPGs) have gained a lot of popularity these days, the “normal” role-play genre remains popular as well. Well-known are the *Final Fantasy* series, *Neverwinter Nights*, and *Fable*. In the world of analog games, role-plays are one of the most applied types of games. These do not involve configurable characters or inventories, but simply involve “taking the role” of a person or organization and enacting a situation together with other “role-players.”

## ***Simulation***

*Simulation* games could take all kinds of forms, from building cities to controlling a big ship. The way to distinguish them is that they have a closer connection to reality than any of the other genres. Fast-paced action, power-ups or bonus points, fantasy or a story are not part of these games. The emphasis in simulation games is offering the player an idea how it would be like to be a pilot, a mayor, or a theme park owner. They are further more free-form and open-ended than the other genres. Goals are for example in many cases not explicitly stated. Basically, simulations consist of three major characteristics:

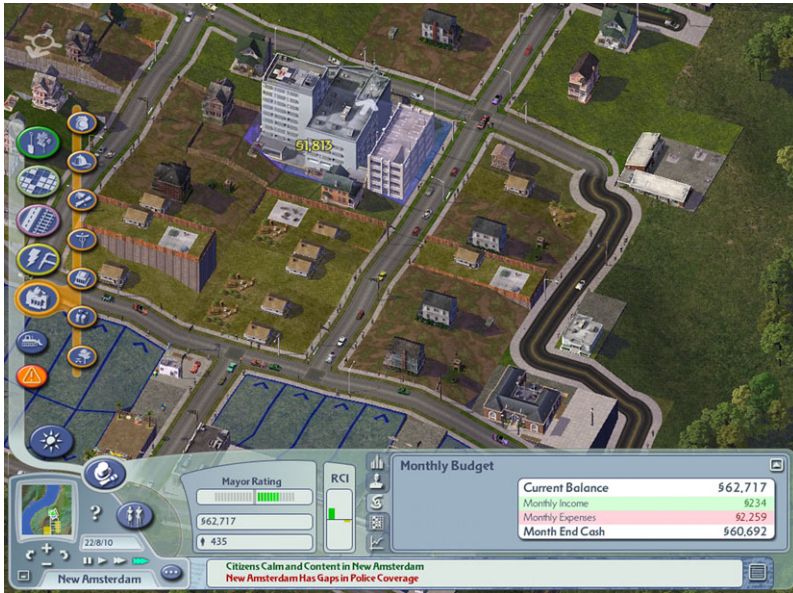
**Fig. 2.19** Stacking blocks in the original *Tetris* version. ©1986 Soviet Academy of Sciences. Used with permission



- **Close to reality:** simulation games, as the name suggest, try to stay close to reality. Consequently, this means fantasy has little place within these type of games.
- **No story:** there is no story within simulation games. No background story or overarching story exists that develops as players go along.
- **Free-form and open-ended:** most simulations offer many degrees of freedom and no explicit goals. Players can make up their own goals or just play around with the game.

Roughly a distinction within this genre can be made into “construction & management” simulations, “vehicle” simulations, and “artificial life” simulations. The first subgenre is in many ways comparable to strategy games. They also have a strong emphasis on rules, economy, and resources. Examples of this subgenre are *SimCity 4* (Fig. 2.20), *Railroad Tycoon*, and all other “tycoon games.” The second subgenre involves games that model vehicles, such as ships, cars, planes or even bikes, very realistically. Examples of this subgenre are *Flight Simulator*, *Ship Simulator*, and *Gran Turismo*. The last subgenre, artificial life simulations, are those games that involve the player in taking care of one or more virtual characters. *The Sims* and *Dogz* are good examples of this subgenre.

Many games (analog or digital) with a serious purpose are reminiscent of this genre, because the majority stays relatively close to reality, like *Supervisor*. For this reason, a number of scholars frequently label games with a serious purpose as “simulations.” This, however, excludes many other types of games, such as *Re-Mission*, while they have certainly a serious purpose. My point of view is that “simulations” are just a genre that designers can choose from the realm of the world of Play (see also Level 1).



**Fig. 2.20** Building a sustainable city with *SimCity 4*. Image provided courtesy of Electronic Arts Inc. ©2003 Electronic Arts Inc. All rights reserved. Used with permission

## Strategy

The origin of *strategy* games is rooted in board games, such as *The Settlers of Catan*. They are obviously centered around strategies. The player needs to deploy these to achieve the goals of the game. As in reality, to deploy a strategy people must have a good overview of what is happening in the field, so strategy games use perspectives and presentation layers that support these aspects. The perspective that most strategy games tend to use is the “isometric perspective.” This makes the player look at the game world from a diagonally oriented bird’s eye view. This is handy, because instead of handling one unit at a time, as with most other games, the player is now able to control multiple units simultaneously.

And managing units to achieve a higher goal is basically what strategy games are all about. Presentation layers differ per game, but in every game they are critical. It can organize and simplify the complexity for the player, and if not handled well, it can make the game overwhelming and confusing. Therefore, important characteristics of strategy games are:

- **Rules:** rules are important in any game, but strategy games are clearly and very visibly centered around them. The rules enable the player to make up their strategies. An example of such a rule could be: “an archer can defeat a knight from a distance, but loses up close.”
- **Isometric perspective:** strategy games use this diagonally bird’s eye perspective as it gives a good overview of the game.

- **Presentation layer:** strategy games have very characteristic ways of organizing information. This organization is important, as these games are complex.
- **Economy:** every strategy game has some type of economy. Players can trade with other players or non-players to get the resources they need or to upgrade existing resources. When playing well, the player is able to buy more and more and create bigger and better units. In doing this, the player has to balance his incomes and expenditures.
- **Resources:** Any strategy game has some type of resources. It might be just plane money, gold or raw building materials, such as wood, stones, water, grain, etc. With these resources the player is able to get other more refined resources (also referred to as units), such as knights, trains, planes, castles and archers.

Strategy games have a steep learning curve and not surprisingly knowing this, they involve much more complicated systems than any of the other game genres. A distinction within this genre is often made between “turn-based” and “real-time” (RTS) strategy games. With the latter time is a constant pressure. With turn-based games, players can ponder over their moves, but with RTS games everything happens at once. For these games reaction time and quick action are as important as strategic thinking. *StarCraft* and *Command & Conquer* are well-known RTS games, while *Civilization* is a well-known turn-based game (Fig. 2.21).

## Virtual World

Over the past few years one genre has received particular attention. This I call *virtual worlds*, but it is also known as “persistent worlds” or “Massively Multiplayer Online Games” (MMOG). Despite the seemingly relatively recent advent of this genre, the historical roots of virtual worlds go completely back to 1978, when *MUD*—later known as *MUD1*—ran on the University of Essex network (Bartle 2003). *MUD* stands for “Multi-User Dungeon” and this term has become synonymous for this early genre.

The games in this genre combine elements of role-playing games, fighting, interactive fiction, and online chat. Players can interact with each other and the world by typing commands that resemble a natural language, similarly to the early text adventures. Nowadays, players can step into gigantic three dimensional virtual worlds inhabited by hundreds, thousands, if not millions of players. For this reason, they are often coined as “massively.” Nevertheless, some of these virtual worlds may be massively, but do not have advanced 3D graphics. They can be played on a browser. In general, virtual worlds have the following characteristics:

- **Social:** as hundreds, thousands, if not millions of players can interact by using chat systems or taking up a challenge together or against each other, this makes them inherently social with all the advantages and disadvantages that follow from this. Bonding may take place, but also misbehavior, such as harassment of other players.





**Fig. 2.21** Building a civilization in *Civilization IV*. The picture shows my Japanese empire with the pyramids in Edo, a Jewish temple in Kyoto, and a library in Osaka. ©2005 2K Games. Used with permission

- **Community building:** one social element which is particularly unique is being able to join a club, guild, faction, or corporation. These are groups of players that have a shared interest in how they play the game. Players of these groups collaborate to achieve these shared interests.
- **Persistent:** these games simply do not stop. When players stop playing, the virtual world lives on. Producers also continue to build on the world by adding content every now and then. Additionally, time is irreversible. It is impossible to create the exact situation when many players are involved.
- **Leveling:** similar to character development and experience points in role-plays, virtual worlds involve ever evolving characters, space ships, towns, or anything else. Upgrading the game elements is generally known as “leveling” as it is often expressed in what level the player has. With this, players can gain reputation.

Most virtual worlds draw heavily upon the role-play genre. Well-known examples are *World of Warcraft* (Fig. 2.22) and *Eve Online*. These are referred to as “Massively Multiplayer Online Role-Playing Games” (MMORPG). Others, which are often the simple browser types of games, like *Travian* reflect more the strategy types of games.

Apart from these game-like virtual worlds, worlds exists that are more free-form and open-ended and cannot be called games in a strict sense. Some of these worlds, like *IMVU*, are only about socializing. These are basically advanced chat programs. And some, like the infamous *Second Life*, are about socializing but also enable users





**Fig. 2.22** Being immersed in a fantasy world with many players in *World of Warcraft*. Screen shot by Eline Hartevelde. Permission was granted by all players. ©2004 Blizzard Entertainment

to create games or other activities, like meetings or virtual tours, inside their virtual world. They are more like (development) platforms that enable users to create something on.<sup>23</sup>

## To Conclude

The above-mentioned genres are not exclusive nor are they completely comprehensive. Therefore, they should not be taken very rigidly. Many half-breeds exist, such as sports games (action and simulation), combat simulations (action and simulation), and action-adventures (action and adventure). An example of a half-breed is *Tomb Raider* starring the famous heroine “Lara Croft.” This is a game in which the player has to (a) jump at certain points from platform to platform, making it a “platformer,” has to (b) shoot her opponents to another gameworld, making it a “action” game, and has to (c) solve mysteries and collect treasures, making it an “adventure.”

<sup>23</sup> Although “leveling” is not explicitly present in the less game-like virtual worlds, such as *Second Life*, the notion of “reputation” is certainly present. By means of having certain objects or having a “cool looking” and more advanced character, players gain more status.

Other than half-breeds, we even may have games that do not fit any genre. They are sometimes referred to as “weird games” (Griffiths 1996).

Despite these remarks, the genres do give some idea and insight what types of games can be found in the world of Play. Large differences can be seen and designers have to consider what types of games or “game characteristics” fit their purpose. With a type of game in mind, designers can look into a number of aspects that are important for developing a game concept. These concern thinking of what “goal(s)” players have to pursue, what sort of “gameplay” the game offers for reaching the goal(s), and in what gameworld it takes place. Last but not least, the issue of “technology,” like what game engine is used or on what platform it is going to be played, has to be taken into account. In dealing with this, designers can draw upon an increasing body of literature from computer science, media studies, and other disciplines interested in the phenomenon called play, and games in particular, to create an interesting game.

Aside from considering the design of the game, designers need to deal with the people that are part of this world. When designing a game, artists, modelers, programmers, level designers, sound engineers, and so on are involved. These people need to know what needs to be made, but may also have their own idea of what makes a game good and this is often different than what subject-matter experts or teachers would think. While of course artistic freedom, creativity, and self-initiative need to be promoted during the development, the ideas of the people from this world need to be aligned with the other two worlds. While sometimes ideas may contribute or overlap, it can happen as well that they are incongruent. Stereotypical responses of people from this world are “but that is no fun” or “I do not find this very intuitive.”

In deciding on issues, the world of Play maintains a different set of criteria than the other two worlds. These criteria are mostly related to making sure that the player is “entertained” in whatever form this may be. Three very closely related criteria can be used to judge the “entertainment value.” These are engagement, immersion, and fun. In other words, from the perspective of this world a game needs to be engaging, immersive, and fun.

## What About the Player?

I have been negligent about a crucial characteristic of games compared to other tools so far: their participatory nature (Murray 1997). Games involve participants which are referred to as “players.” This seems rather straightforward, but it is an important point to make as it signals how games differ from other tools, such as hardcore simulations, and, subsequently, how this difference can be exploited and used for non-entertainment purposes.

As I discussed earlier with the world of Meaning, the exploitation and usage of games can roughly be distinguished in two ways. Players can either be an input to achieve an outcome, such as with games for theory testing or data collection, or can be the subject of an outcome, such as an increase in awareness or knowledge about a certain topic. The two possibilities are not incompatible with each other. Both can

be applied at the same time. In fact, it is often hard to separate them. It depends on the purpose of the game what possibility is emphasized.

Take again the *ESP Game* (Fig. 2.15). The purpose of this game is clearly “data collection” by means of human participants (Von Ahn 2005). Nevertheless, the people that play the game are urged to critically think about the pictures they are confronted with. They have to extract visual cues from the picture and elaborate on them by defining what these cues are. As the game uses “taboo words,” words that cannot be used, better players are those that have a more richer vocabulary. Additionally, to play the game well, players should be able to “think” what somebody else would guess. This requires empathy. The game, therefore, teaches players some visual, social, and, above-all, language skills. While the main purpose of the *ESP Game* is to use the player as input, the players themselves get something more out of the experience than simply “having a good time.”

This discussion about the position of the player relates foremost to the world of Meaning. It is about defining what the game needs to achieve. This is actually just one way of looking at players. It turns out that—based on TDG—we can define three different perspectives to look at a player: the player as person, the player as interpretant (or learner), and the player as player. Each of these roles relate to one of the worlds and are discussed below:

- **Reality—The player as person:** each player is first and foremost a “person.” Players have a personality, culture(s) to which they belong to, a social and work environment, attitudes and so on. All of these aspects (and more) influence who the player is “as a person.” They also influence how a player experiences and relates to a game. It was, for example, found that the emotional expressions of children differ in playing alone or together and across cultures. Dutch children were far more timid and calm, even when another Dutch child was present, in comparison to Pakistani children, who were extremely loud and emotionally expressive (Shahid et al. 2008).
- **Meaning—The player as interpretant:** people interpret information differently and so do players when making sense of a game. This depends, for example, on the existing knowledge, education, learning styles, and expectations that players have. Players will not make game interpretations, such as Bogost (2007) about *Grand Theft Auto: San Andreas* and Murray (1997) about *Tetris*, if they are not familiar with the American society. Motivation is also certainly an issue. If players do not have the desire to invest in the subject of a game, they will not make an effort. Since not all games are about education, I have opt for “interpretant” instead of “learner.” However, when using a game to teach, this perspective can also be formulated as “the player as learner.”
- **Play—The player as player:** finally, the player is what it says it is: a player. But no player is quite the same. They differ amongst each other. Players have their preferences in terms of the games they play and how they play them. Bartle (1996) identified, for example, four player types, the “achievers,” “explorers,” “socializers,” and “killers,” in how players can engage with a game. Achievers prefer to get the highest score or simply succeed in the game, explorers like to wander off and discover the virtual environment they are in, socializers like to

play together with others and see playing a game merely as a means to meet others, and killers thrive on manipulation, destruction, and competition with other players. Players further have different game skills and experiences that make a difference in how they play a game.

Much similar to the worlds of TGD themselves, the three perspectives are interdependent on each other. How players play the game as a player will be most likely influenced by who they are as a person. The way they play it, will also influence what they will interpret and how. A competitive player will see every other move by a player as a threat, while a collaborative player will take a more positive stance at first. And, of course, culture and other personal characteristics also have a great influence on how information in a game is interpreted.

When designing a game, it is important to keep these three different perspectives in mind, especially since players are crucial (if not the most crucial) element in a game. With these perspectives, we have a way of thinking about players. In evaluating our designs, we can, for example, understand why players “do not get the game,” since the game is probably irreconcilable with their real world (Reality). Or it might be that they do not have the basic knowledge that is required to play the game (Meaning). Or it could be that they simply do not have the skills to play it (Play). But in our designs we can already harness these perspectives upfront to make sure it is very unlikely that the target group “does not get the game.”

In the rest of this book, I will not specifically address the notion of player and the three perspectives associated with it. It is sufficient to understand how the “player” relates to the idea of TGD as mentioned here and that it concerns an aspect that needs serious attention.

## And What About Other Approaches?

Similar to the programming approaches, like object-oriented and procedural programming, multiple game design approaches may exist or come into existence. TGD is simply one way of looking at the artifacts we call games. First of all, an abundant and ever increasing number of books have been written about game design in general (cf., Fullerton et al. 2008; Rollings and Morris 2004; Salen and Zimmerman 2004; Schell 2008). Most of these books provide practical tips and insights in how to design any game. These tips and insights are highly valuable, also for designing games with a serious purpose. One of the worlds that needs to be considered is Play and these books provide the knowledge to consider this world.

This book is, however, above-all about games with a non-entertainment purpose and in this field several attempts have been made to come up with game design approaches specifically for these types of games. In my search for these approaches I found much to my surprise at first that while a good number of them have been independently developed, they are strikingly similar to each other and to the idea of

TGD. This concerns the delivery modes by Aldrich (2004),<sup>24</sup> the four dimensional framework by De Freitas and Oliver (2006),<sup>25</sup> the three design foci by Frank (2007), the simulation movement space by Hall (2009), and the heart of serious game design by Winn (2009). The latter approach parallels TPACK, which stands for “Technological Pedagogical Content Knowledge” as well as for “total package” (Mishra and Koehler 2006).<sup>26</sup> This framework is applied to classroom settings in which technology, such as websites and videos, but also games (cf., Foster and Mishra 2009), are being used.

An overview of all these six approaches and TGD is given in Table 2.1. From this overview, we can retrieve that all these attempts speak of three or include three rather similar cores. It could, of course, be that it is coincidence or that people like to think in threes, but on second thoughts I like to think not. I think that sooner or later, when people get started with designing games, they discover that they have to deal with people, disciplines, aspects, criteria, and so on, that I have related to the worlds of Reality, Meaning, and Play. The reason why I like to think this is that conceptually the approaches are very similar to each other. For example, simulation, context, realism, and content are more or less related to what I call “Reality.” The same line of reasoning can be applied to the worlds of Meaning and Play.

The similarities with TGD do not stop here. Frank mentions that the three foci are interdependent and need to be balanced to achieve a well-designed game. He also lists “dimensions” that are part of the foci, such as mystery and validity, that designers could take into account. Even closer comes Winn’s the heart of serious game design and Mishra and Koehler’s TPACK. They also talk about creating a whole that is more than the sum of its parts by considering three interdependent components, which forces designers to work inter-disciplinary and even trans-disciplinary, and with which tensions or conflicts could arise that need to be resolved by making trade-offs:

... a change in any one of the [components] has to be “compensated” by changes in the other two... [Design] is a complex task, often riddled with contradictions and tensions. [Teachers] have to resolve these contradictions and tensions by looking at all the components that

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<sup>24</sup>The delivery modes are actually three of the six criteria Aldrich (2004) mentions to build a game. I left out the other three, which are systems, cyclical, and linear content, because these content types are provided by the delivery modes.

<sup>25</sup>The four dimensional framework consists—of course—of four dimensions rather than three. I left out the fourth, the “learner,” because this dimension is accounted for by TGD and the other approaches implicitly.

<sup>26</sup>In the original article Mishra and Koehler (2006) coined their theoretical framework “TPCK.” Later, they changed this to TPACK. This framework is built on Schulman’s (1986, 1987) formulation of “pedagogical content knowledge” (PCK). He observed that teachers’ subject knowledge and pedagogy were being treated as mutually exclusive in research and education programs and argued that it would be better to focus on the blending of content and pedagogy to get an understanding of how particular aspects of subject matter are organized, adapted, and represented for instruction. For teachers to be successful, they need to deal with C and P simultaneously to make sure the content is (re)presented in the best way possible (by means of analogies, illustrations, examples, etc.). Doing this requires another set of knowledge which Schulman referred to as PCK. More on information about TPACK can be found at <http://www.tpack.org>.

Table 2.1 Different but comparable approaches to TGD

|  |  |  |   |   |  |   |
|--|--|--|---|---|--|---|
| Triadic Game Design  | Delivery modes (Aldrich 2004)  | Four dimensional framework (De Freitas and Oliver 2006)  | Balancing three design foci (Frank 2007)  | Simulation movement space (Hall 2009)   | The heart of serious game design (Winn 2009)   | TPACK (Mishra and Koehler 2006)   |
| <i>Reality:</i><br>a paradigm based on elements of the real world (experts or validity) and the development of a model of reality    | <i>Simulation:</i><br>selective representation of situations and user interaction.<br>Includes the consideration of technology | <i>Context:</i> focuses on where playing takes place.<br>Includes macro-level (historical and political) and micro-level (availability of resources) factors | <i>Context:</i> relates to the intended use of the game as well as surrounding factors. For whom, what, and under what circumstances will be played | <i>Realism:</i> a game can be placed on an axis ranging from real to surreal                | <i>Content:</i> relates to items from domain-related areas (ecology or health)           | <i>Content knowledge:</i><br>knowledge about the actual subject matter that is to be learned or taught  |
| <i>Meanings:</i><br>a paradigm based on elements for creating value (teachers or transfer) and the development of a value proposal   | <i>Pedagogy:</i><br>methods and tools to ensure that the students' time is spent productively (debriefing or reflection)       | <i>Pedagogy:</i> focuses upon the processes of learning both formal and informal and the methods and models used to achieve learning                         | <i>Training objective:</i><br>the primary incentive to create a game. Relates to the scenario, relevancy, and validity                              | <i>Functionalism:</i><br>an axis that determines the extent of built-in learning mechanisms | <i>Theory:</i> theoretical notions that can be integrated in a game (persuasion or flow) | <i>Pedagogical knowledge:</i><br>the processes and practices or methods of teaching and learning        |
| <i>Play:</i> a paradigm based on elements for creating playful activities (programmers or fun) and the development of a game concept | <i>Game:</i> the provision of familiar and entertaining interactions (puzzle solving or competition)                           | <i>Representation:</i> the mode of presentation, the interactivity, the levels of immersion, and fidelity used   | <i>Engagement:</i><br>motivational characteristics are needed to improve training outcome   | <i>Engagement:</i> axis on which a game can be placed ranging from unadorned content to fun | <i>Game design:</i> the practice of designing (programming or storytelling)              | <i>Technological knowledge:</i><br>knowledge about standard technologies and more advanced technologies |



play into their design. They have to weigh alternatives and take decisions factoring the differential effects of their choices. (Mishra and Koehler 2006, pp. 1030–1040)

Of course, differences exist. De Freitas and Oliver's context and Frank's context, for instance, also deals with the (educational) situation in which the game is going to be used. This is something that would be part of "Meaning" with TGD. Furthermore, Winn's theory would be applicable to any of the worlds of TGD. Each world has its own set of theories. And while Aldrich's simulation incorporates much (technological oriented) elements that are part of Play, with De Freitas and Oliver's representation it is the reverse. This composes of many elements that I consider to be part of Reality.

But aside from the categorization and linguistic<sup>27</sup> choices, the approaches also differ in what they focus on. Except for TGD and Winn's the heart of serious game design, all the other approaches only focus on education and training. And although Hall's movement space and De Freitas and Oliver's dimensions can easily be used for design, the first has been developed to classify games and the second to evaluate them. When it comes to the design, Mishra and Koehler's TPACK is oriented at designing the activity rather than the artifact itself. It essentially is about integrating *knowledge* about three components to ensure technology is properly used for teaching some content.

Most importantly, however, a quite radical difference exists between TGD and the other approaches. TGD is about three distinct perspectives grounded in different disciplines and affiliated with different people that (should) influence how the eventual game is designed, while those other approaches speak of elements (or axes onto which elements can be placed) that are part of the design and that need to be considered or taken care of. The difference is subtle yet significant. TGD is a "multi-paradigmatic" approach, creating a sense of how to look at games, whereas the other approaches give a pragmatic description of what "ingredients" are needed in "preparing" (or evaluating) a game. TGD, therefore, includes much more and starts from a much higher level of analysis.

These other approaches nevertheless show that what I have found and reflected on during the design of *Levee Patroller* is not something "out of the blue." They provide a slight evidence that the idea of TGD makes sense. This means that whatever designers decide to use, they need to acknowledge that designing a game for

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<sup>27</sup>Over time I have been rethinking myself what terms to pick to denote the three worlds. At first, I decided to use "Reality, Pedagogy, and Game." I refrained from the term "Pedagogy" as not every game with a serious purpose is used for training and education. Additionally, the term is derived from the ancient Greek "paidagogos," the slave who supervised the education of slave children. The modern interpretation of pedagogy is the art or science of being a teacher. However, in essence the word "paidia" refers to children, which is why some like to make the distinction between pedagogy (teaching children) and andragogy (teaching adults). To avoid confusion about whether this approach is only directed at children or not, concerned another reason to let go of Pedagogy. As for Game, the reasoning was plain and simple: this term connotes too much the artifact itself and not a "world." After that, I started using more abstract terms, such as "Ontology, Semiosis, and Ludus." Although I liked the terms, I could not see how actual designers would use this in practice.

**Table 2.2** Overview of the topics from each world that can be put into the mix

| Reality (domains)        | Meaning (values) | Play (genres) |
|--------------------------|------------------|---------------|
| Business & management    | Knowledge        | Action        |
| Health                   | Skills           | Adventure     |
| Military                 | Attitudes        | Puzzle        |
| Politics & society       | Assessment       | Role-play     |
| Public policy            | Data collection  | Simulation    |
| Safety & crisis response | Exploration      | Strategy      |
| Science & education      | Theory testing   | Virtual world |
| Etc.                     | Etc.             | Etc.          |

a serious purpose involves dealing with multiple elements. And to deal with these elements, they have to act much like a juggler (Fig. 2.3).

## Toward Triadic Game Design

In the spirit of Machiavelli who stressed that it is important to lay foundations, this level laid the foundations of TGD. It discussed that designing games requires (a) taking into account a design space of three different worlds, (b) balancing these worlds by making trade-offs, and this works at best when (c) considering these worlds concurrently. It was further discussed of what these three worlds consist of and how they look at the design process. From this, it became clear that from the perspective of the world of Reality we encounter several domains to which games are applied to. From the perspective of the world of Meaning it is possible to conceive of different sorts of values that can be retrieved from playing games. Finally, the perspective of the world of Play showed us that games can be affiliated with a variety of genres. An overview of these perspectives is given in Table 2.2.

From this overview it may become clear why it is hard to categorize games or, in fact, why people do so in different ways. A game can, for instance, be classified as a “first responder crisis game,” “operational training game,” or “3D first person action game.” Each of these classifications relates to one of the worlds: to Reality, Meaning, and Play, respectively. Depending from which world a game is looked at a certain categorization is made. Using TGD the categorizations people make can be traced back to one of the worlds. The types of classification possibilities also show that these games are inherently “triadic” in nature.

The overview can additionally assist in designing games. In creating a model of reality, value proposal, and game concept, it is useful to understand what sort of domains, values, and genres are available and how they can be mixed and put together to get a balanced game: a game with harmony. This requires to see the linkages between them, and most importantly, to have an overview. Designers need to see the “big picture”—the system at large—of what the game needs to become.

With this in mind, they can judge what sort of ingredients they need to add to the mixture. Maybe it needs to be more “spicy” or maybe it needs more “salt.” This may obviously ask for some “tasting” as well, for instance by testing prototypes with users, as it is often difficult to judge what is needed.

But to be able to make a proper mixture and juggle with the worlds, the different worlds and how to balance them needs more explanation. This level was simply needed to give the necessary foundations to build on. Therefore, first the worlds of Reality, Meaning, and Play (in this order) are further elaborated on by discussing in detail what aspects and criteria are deemed important by each world. Second, a number of stereotypical tensions are explained that can be experienced while balancing a game. No straightforward solutions are handed over. Instead, a feeling is given of what can be expected and how a designer should think in solving these tensions.

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