PLAYFUL ORGANISATIONS & LEARNING SYSTEMS

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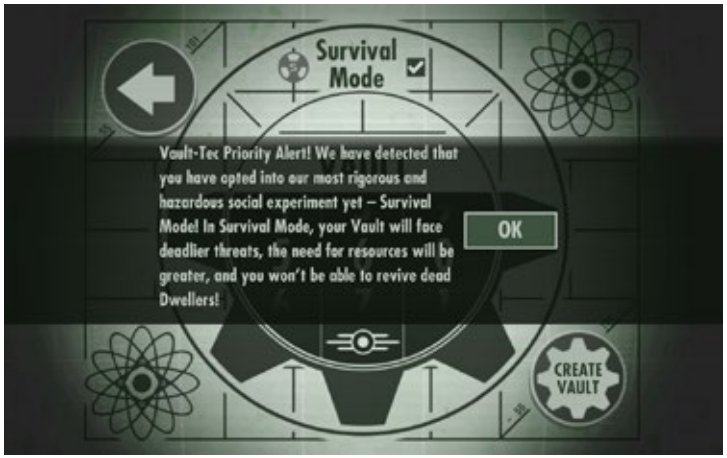


FIGURE 1 SCREENSHOT FALL OUT 4 (BETHESDA GAME STUDIOS)

Introduction

Dear president of NHTV, beste Hein,
Dear dean of the Academy of Digital Entertainment, beste Daphne,
Dear colleagues, friends and family

"Life is a game in *Survival Mode*"

Life is a game that can only be played in *Survival Mode*. Like the warning message in FALL OUT 4 [1], we face deadly threats, we urgently need resources and we are certainly unable to revive 'dead dwellers'. Unfortunately, we cannot re-start, fast-forward or re-do the things we've done wrong. The only thing we can do is play, and hope that this prepares us for dealing with the complexity of life.

We are formed by play. Games shape society in many ways: culturally, economically and technologically. This was not originally *my* idea, of course; I am only standing on the shoulders of giants.

In 1938, Johan Huizinga published *Homo Ludens. Proeve eener bepaling van het spel-element der cultuur* [2]. *De Spelende Mens*, in its English translation *The Playing Man*. His argument, which has since become well known, was that culture emerges from play. We see and understand more of the rules and interactions in society – in the world of science or in politics, for instance – when we view society through the lens of play. The Netflix series *House of Cards* portrays politics as a ruthless and cynical game; so does *Game of Thrones*.

We see and understand more of the rules and interactions in society – in the world of science or politics, for instance – when we view society through the lens of play.

Huizinga could never have imagined the digital games we play today. He could not have foreseen how important games and gaming technology would become in shaping society. Games have become so significant in society that they have become the subject of a young scientific discipline, known as *games studies* [3]. Part of this discipline is concerned with serious games.

This lecture is about serious games: what they are, what I think they should be, and how they can have a deep and socially beneficial impact on the performance of teams, organisations and systems.

What are serious games?

A language game

As a trained political scientist, philosopher and policy analyst, I have become fascinated by a methodology that uses the principles and technology of games to help us understand real-life complexity and prepare us for imminent change. Nowadays, this methodology is known by many different names, including simulation-games, serious games, applied games, persuasive games, gamification, and many more. Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) applications, such as our university's virtual supermarket and bicycle simulator, fall into the same category.

The existence of so many names and manifestations creates confusion and gives rise to territorial conflicts, especially where research funding is concerned. Why make it so difficult? Wouldn't it be better if we were all to decide to just use one term – applied games, or serious games – and agree on a proper definition? We could then draw a sharp demarcation line between serious games, entertainment games and VR.

But that would not be a good idea!

Despite the possibility of rescuing serious games under the definition I have just offered, I do not want to preserve that name. Instead, I would like to advance persuasive games as an alternative [48, p. 59]

'Gamification is bullshit' [49]

In a recent article published in *The British Journal of Educational Technology* (BJET), I argued that there is no inherent and objective truth captured in the various names, definitions and taxonomies [5], [6]. This is what Wittgenstein called a *language game*: a struggle for dominance between frames that put forward different views on the utility of games for society. Sometimes we use the

FIGURE 2 BICYCLE SIMULATOR; ALSO SERIOUS GAMING? (CYCLE SPACES, NHTV [4])

same words for different things. Sometimes we disagree strongly with words, even though our perspectives are not in fact far apart. But above all, *he who controls the words has the power*.

On the whole, technical universities are particularly interested in simulations. Applied universities (*hogescholen*), of course, have a close affinity with 'applied games'. Specialists in the social sciences tend to go for 'serious games', and the humanities tend towards 'persuasion' and 'ludification'. Design schools opt for 'playful interaction'. Companies do not hesitate to rebrand an old product as a more fashionable item. Nowadays, gamification, virtual reality and augmented reality are very much in vogue.

It is a rather *silly* language game, because it does not give us a better understanding of the value that games have in and for

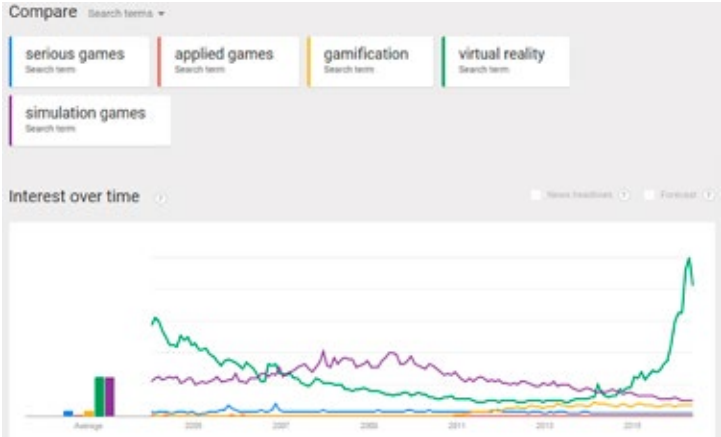


FIGURE 3 TRENDS IN GAMING CONCEPTS (GOOGLE TRENDS, 10 MAY 2016). NOTE: THE NETHERLANDS TOPS THE WORLD RANKINGS FOR ITS INTEREST IN 'SERIOUS GAMES'. THE TERM 'APPLIED GAMES' IS USED PRIMARILY IN THE NETHERLANDS. THE TERM 'SIMULATION GAMES' STILL ATTRACTS MORE INTEREST THAN 'SERIOUS GAMES', BUT INTEREST IS DECLINING. 'GAMIFICATION' SURPASSED INTEREST IN 'SERIOUS GAMES' AROUND 2012. INTEREST IN THE TERM 'VIRTUAL REALITY' DECREASED AND THEN SHOWED A SHARP RISE FROM AROUND 2014.

society, whether for entertainment purposes or with regard to impact. More importantly, this game diverts our attention away from important questions, such as: what are the different values that society accords to games? How do these values change over time? Understanding the value systems behind games helps us to understand ourselves a little better.

Intrinsic value

First of all, games are entertainment. They give us pleasure, or whatever we would like to call it: engagement, fun, thrills. This is the intrinsic value of games: the value of gaming 'in itself' or 'for its own sake'.

The intrinsic value is the value that gaming has 'in itself' or 'for its own sake'.

We are best acquainted with the intrinsic value of games through our emotions and physical responses. When we play, we literally feel the excitement. Our heart rate goes up. We express our enjoyment by cheering and laughing. Sometimes we feel happy and connected, while other times we can also feel tired, bored, frustrated and angry. Children need to learn not to cry when they lose.

By measuring emotions, using questionnaires or biometric sensing, we can try to understand the game experience itself, as well as the relationship between the design of a game and the experiences it brings about.

The well-known theory of *flow*, for instance, postulates the relationship between emotions and learning or change [7]. When we are over-challenged in a game or at work, we become anxious and frustrated. When we are under-challenged, we experience feelings of boredom. Flow is a state of mind where the skill level and the challenge are in perfect harmony with one another. We are able to concentrate well and lose our sense of time and place. Games are very good at creating flow, and this is how they keep us playing.

Playing games can change us in profound ways, especially if we play frequently and intensively. Researchers at Charité University in Berlin asked an experimental group to play SUPER MARIO for at least 30 minutes a day for 22 months [8]. They then compared

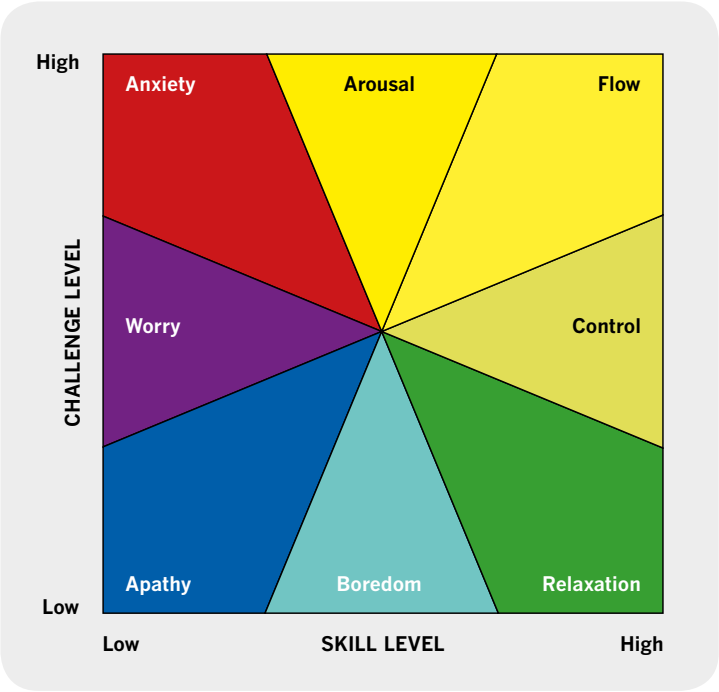


FIGURE 4 CSIKSZMIHALYI'S THEORY OF FLOW AND EMOTIONS (REWORKED)

brain scans for this group with those for a control group of people who had been engaged in activities other than gaming. Among the gamers, they found a significant increase in 'grey matter' in the top-right hippocampus, a part of the brain that is important for spatial navigation. In other words, the brain adapts to playing SUPER MARIO, just like muscles can be enlarged by exercising in the gym.

Drone-racing is an up-and-coming sport [9]. Recently, experiments have been conducted in which a drone is controlled through the use of electromagnetic brainwaves [10]. When neuroscientists are correct in their research findings, and brain-controlled drone-racing becomes popular in the near future, what effect will this have on the players' brains? What effect will drone-racing have on society?

We can call this the external effect of entertainment games: the effect that the pervasive playing of games can have on our brains, but also on the ways in which we communicate, on social behaviour, on culture, on technological innovation, and so on. These effects are not intentional; they simply occur. But we also have opinions about them.

Like all forms of art and culture, politicians and others who control funding may lack sufficient appreciation of the intrinsic value of games. Policymakers are certainly showing an interest in managing the external effects of entertainment games, however, whether this concerns the risks of addiction or aggression, or technological innovation and economic growth. This is the politics and management that lies behind entertainment games.

Games do more than this, however: they also have an extrinsic value.

Extrinsic value

Games are good at creating flow, and flow is a perfect state for learning. One should not be surprised, then, that scientists are exploring and using the mechanics and technology of games to design better learning methods, for instance in therapy or educational contexts, or at work. Games have become an instrument or tool for learning and change.

The extrinsic value of games is pursued not for its own sake, but for the sake of something else, especially for its beneficial consequences.

This is the extrinsic value of games: the value of games that is pursued not for its own sake, but for the sake of something else, especially for its beneficial consequences.

Let us return to the example of how gaming affects the brain. One of my serious gaming colleagues

works as a neuroscientist at the University of Graz. He uses serious games to examine whether certain parts of the brain can be trained using neuro- and biofeedback, a kind of physiotherapy of the brain [11]. He has patients who are recovering from a TIA (a stroke) race a snail on a computer screen, using electromagnetic brainwaves induced by a high state of concentration. When patients do this regularly, it boosts their recovery.

The relationship between a game, emotions and learning in serious games is much more complex than in entertainment games. In many situations, we are not aiming to make something fun, but to provoke emotions such as relaxation, arousal or anxiety. In flight simulators or war games, people are put under a high level of stress. This can be very useful and effective for recruiting, training and assessing soldiers, pilots, astronauts or paramedics. Inducing a high level of anxiety in virtual reality can be useful as part of treatment for panic, arachnophobia (fear of spiders) or agoraphobia (fear of open spaces) [12].

Serious games are not only effective in psychotherapy, but also in organisational change. One of my serious game colleagues is an associate at a global consultancy company. He frequently tells me that he wants his clients to feel the pain of change, but in a controlled way and without external consequences. No pain, no gain. Business and management games are good at this: when playing games, managers can experience success and failure without external consequences.

Another serious gaming colleague uses simulation games at the famous INSEAD business school, based in Fontainebleau, near Paris. His players include senior corporate executives who have enjoyed impressive careers in companies all over the world. The well-known organisational psychologist, Manfred Kets de Vries, who is affiliated with the same business school, has argued that many of them have sociopathic personality traits [13]. One of INSEAD's

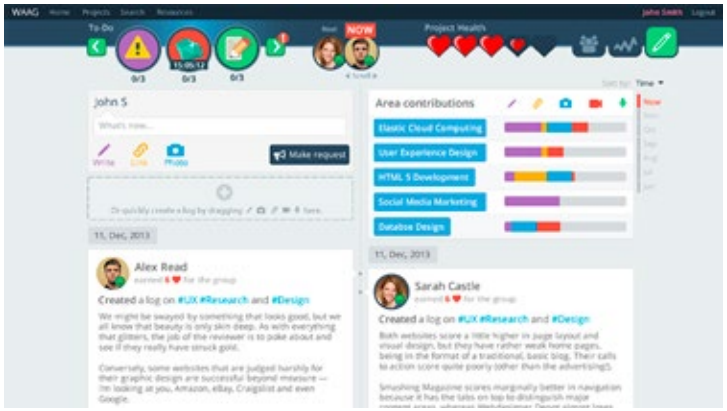


FIGURE 5 STARQUEST (PLAYGEN)

successful games is EAGLE RACING, a game about moral dilemmas in the corporate sector [14]. It is set in the context of a Formula 1 racing company [15]; a world of glamour and ambition, where it is tempting for players to overstep moral boundaries. People are often unconsciously incapable, and it is a big step for them to become conscious of their incapability. This is a first, big step in learning, and it feels extremely uncomfortable.

When it comes to learning and change through serious games, many factors come into play: personality, context and objectives. Take the example of personality. Some people have a competitive personality. They always want to be top of the rankings and cannot bear to lose, whereas other people have more collaborative tendencies and dislike a competitive atmosphere. When it comes to gaming for entertainment, the player selects a game of his or her liking. When we use games in a professional context, however, the players cannot always choose freely. The serious game is part of the curriculum, training, meeting or organisational change process.

One of my colleagues owns a very successful company in London that makes games, simulations and gamification platforms. To gain

a better understanding of the impact of his designs, he decided to study the effects of his products in doctoral research [16]. He asked university students to use his gamification platform, called STARQUEST, in their project work.

Half of the teams worked on a platform that was designed to induce competition among the members of the team. The system gave feedback on the contribution made by each team member and ranked their names on a game-like dashboard. The other half worked on the same platform, but this time with dynamics intended to produce collaboration. The dashboard only showed team productivity as a whole, without ranking the individual contributors.

The results of the study showed that, on average, competition increases team performance, but only slightly, and it certainly does not have beneficial effects on all players and teams. Students' personalities had a significant mediating effect on team performance under competitive or collaborative conditions. The lesson that we can derive from this is that we should be careful when using game dynamics for competition to increase productivity in an organisation. People respond in different ways. They may withdraw, or they may start to undermine the performance of others within the same team or organisation in order to improve their own ranking.

Games are ALL this and more! Let's try to synthesise what we have learned so far.

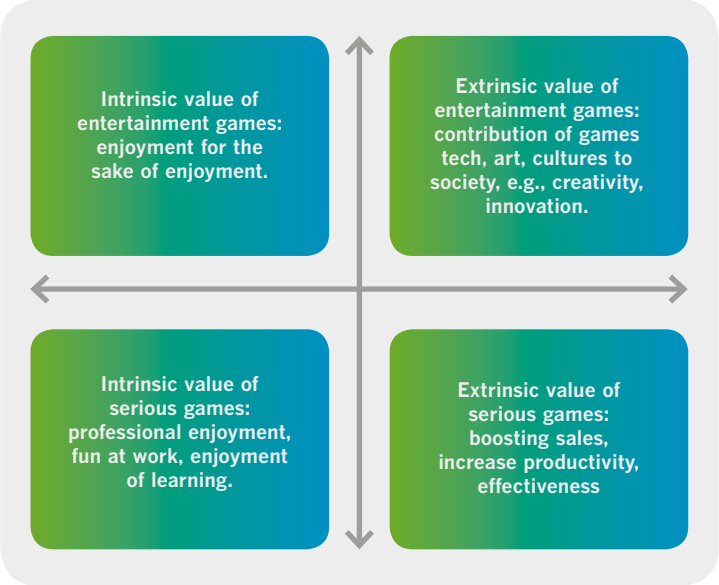
The value frame

One important take-home lesson is that there is no sharp demarcation line between entertainment games and serious games. Entertainment games have external effects and extrinsic value. Serious games also have intrinsic value.

There is no sharp demarcation line between entertainment games and serious games. Both have intrinsic and extrinsic values.

For example, Maersk and KLM have developed the games QUEST FOR OIL [17] and AVIATION EMPIRE [18], which constitute brand new ways of building relations with customers. These games won several awards, not for their social contribution, but because they achieved high rankings on the entertainment-game hit chart. Both reviewers and players thought the games were well-designed and fun to play, and they were discussed in gaming magazines and blogs. QUEST FOR OIL was covered by CNN, Fox and Sky. To what extent, though, are we aware that we are part of a company's customer relations strategy, and that game-play data are a company asset?

The value frame for games looks more like this.



Due to the fact that games have external effects and extrinsic value, politicians and other decision-makers have a tendency to attempt to steer games in certain directions. 'I want you guys to be stuck on a video game that's teaching you something other than just blowing something up,' President Obama is reported to have said in March 2011. He was appealing to the video game industry to make educational games, such as the apps for healthy kids supported by Michelle Obama [19], [20].

Over the last decade or so, an impressive industrial innovation system has emerged in the Netherlands and in Europe to promote and steer the use of games in society. Among many others, institutions such as the NWO, the KNAW, EZ-RVO, Topsectoren, Click.nl and the H2020 Games and Gamification programmes have taken a considerable interest in the social utility of games. The games phenomenon is certainly worthy of our close attention in the innovation sciences: where has it come from, and does it matter?

There are thousands of games that have been designed to teach us physics, languages or history, or about the life of a painter or historic figure. There are even more games that try to persuade us to live healthier lives, stop smoking, practise safe sex, or feel empathy for refugees or the poor. Advertising and branding games, meanwhile, are designed to make us like a company and buy its products. Persuasive games try to win us over to a particular political viewpoint.

There are a number of compelling reasons for examining such games very critically.

(1) We know remarkably little about who plays such games, how many people play them, why they play them, and what this delivers.

(2) The intervention models on which these games are based are seldom explicated or critically examined. Is it realistic to

think that serious disorders such as ADHD or obesity might be remedied by allowing children to play a computer game for a few hours in their school classroom or at home?

(3) There has been serious neglect of the ethical considerations of developing and using games to induce behavioural change among vulnerable target groups, such as young children or people with disorders or societal inclusion issues.

(4) The methodologies for measuring the impact of serious games are not very well established. Although there are a number of good review studies that provide ample evidence of learning efficacy and behavioural change effects at the personal level [21], these studies remain case-based and unsystematic. Negative results are not reported.

In view of the above, we could make much better use of the serious and applied games to which we have access for comparative research. We need to develop the methodologies, concepts and tools in order to gather data systematically and publish the results, including negative ones. In a couple of recent publications, I have tried to lay the foundations for such an approach [22]–[24].

However, I think that we should go beyond individual learning and behavioural change games. We can have a deep impact with games that address the performance of teams, organisations and systems. If, in some kind of bizarre experiment, we were to deny a child the opportunity to play, we would quickly realise that this would seriously disrupt the child's development. The same is true, I believe, for teams, organisations and systems: organisations and systems that for some reason or another are not able to play, or refuse to play, are disrupted in their ability to change and to innovate. We can make organisations playful and help systems learn with games.

Let us now look at how this could work.

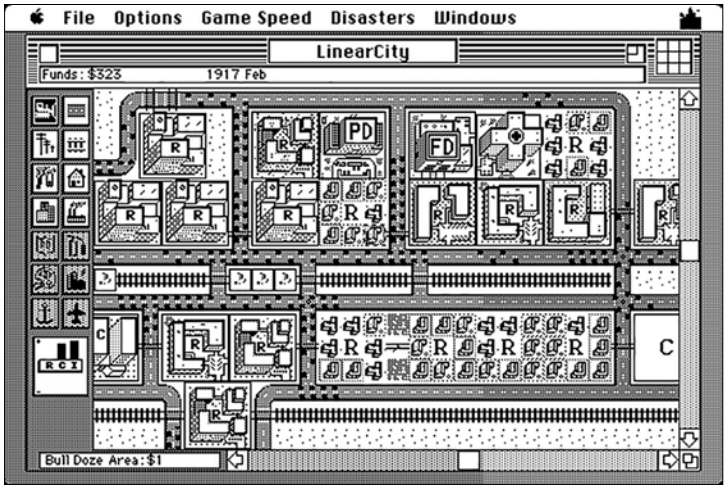


FIGURE 6 SIMCITY AS I USED TO PLAY IT ON MY APPLE MACINTOSH AROUND 1989 (MAXIS)

Games for policy, organisation and management

Serious gaming is having a deep, positive social impact with games on the performance of teams and organisations and the management of complex systems

My particular area of expertise is the use of serious games for policy, organisation and management. From the 1950s onwards, policy analysts in the US started to use an informal method of 'simulation gaming', first for military and strategic purposes, and later for all areas, including logistics, education, urban planning and sustainable development. In a frequently cited article in *Simulation and Gaming*, I have analysed how simulation gaming and serious gaming evolved into a discipline [25].

There has been a continuous interchange of ideas and technology between entertainment games and serious games. To give one example, at the end of the 1950s, Jay Forrester developed system

FIGURE 7 NEXT-GENERATION URBAN PLANNING (TYGRON, 2016)

dynamics thinking and urban dynamics modelling [26]. This subsequently inspired Will Wright to develop SIMCITY in the mid-1980s [27]. In turn, the concept and technology of SIMCITY became the inspiration for serious game companies to develop a multi-player SIMCITY for real urban planning, now known as 'next-generation urban planning' [28]. This combines a computer game with urban simulations and stakeholder collaboration.

Prior to 1998, I would never have described myself as particularly interested in or qualified to work on games. Since around 1998, however, I have initiated and led dozens of serious game projects commissioned by external clients, most of them in the public sector. These projects have involved an intricate mixture of gaming technology and role play, mainly for learning, decision-making and research, and often in the area of infrastructure development [29]. We developed these games in close co-operation with partners, game developers, students and researchers. The results have been published in more than a hundred journal and conference papers, and a dozen doctoral theses under my supervision [30]–[34]. Here are a few of the highlights, in order to give you an insight into what I understand to be serious games.

Gaming the future of an urban network

Using games to support urban planning processes has been a recurrent theme and significant area of application. In the URBAN NETWORK game (2002), developed for and with the Netherlands

FIGURE 8 URBAN NETWORK GAME (2002)

Institute for Spatial Research (RPB), we demonstrated how the concept of 'development planning' (ontwikkelingsplanologie in Dutch) would work for Brabant's urban network under different economic and ecological scenarios [50]. The game was played in the business lounge of the PSV football stadium in the city of Eindhoven, over two full-day gaming sessions with hundreds of policymakers and stakeholders from Brabant. The RPB study offered critical insights into the inner workings of development planning and is frequently cited both for its innovative game and scenario approach and for these insights.

Gaming strategies for the Second Maasvlakte Area, Port of Rotterdam

In the project SIMPORT MV2, undertaken for the Port of Rotterdam (2004-2010), we aimed to understand and validate long-term strategies for the design and exploitation of a major port expansion project known as the Second Maasvlakte Area (2e Maasvlakte) [51]. We developed a multiplayer, SimCity-type game that allowed port managers to design their own Second Maasvlakte Area and see how it performed over time. Over the years the game has been played by thousands of students and executives worldwide, and was only recently phased out. At the time, we did not have the option of building the game in an existing game engine such as Unreal or Unity, so we developed the engine from the ground up. As it happened, the project nourished a start-up, which has

FIGURE 9 SIMPORT MV2 (AROUND 2007)

had global success with its next-generation urban planning platform: a game-engine for game-based, collaborative urban planning [28].

Policy implementation

In a game called INFRASTRATEGO, developed around 2002, we explored how the Dutch electricity market would operate in the wake of imminent deregulation and liberalisation policies [52] [53]. Looking back, I am struck by how much of the power companies' and grid managers' strategic behaviour – opposition to unbundling, for instance – was already displayed in the game. In 2004 and 2006, we prepared the senior management of all judicial courts in the Netherlands, and later also the public prosecution office, for the implementation of new financing and governance systems [54]. The tension experienced today between efficiency and professional quality was already red-flagged in the game sessions in 2004. In any case, the games made a significant contribution to the smooth implementation of the policy reforms, even though some of the underlying strategic choices have since been questioned

Playing games with non-gamers

The players of these serious games were judges, police officers and public prosecutors, and port and water managers. They worked as CEOs, operational or project managers, or managing directors in areas such as HRM, Learning and Development, Marketing and Sales. It is not easy to tell or teach these professionals anything new, let alone to make them change.

However, nearly all of these professionals are what we call 'game illiterate'. When we climb the ranks throughout our career, we forget to play; indeed, we forget how to play. In the introduction round of my game sessions, I usually ask the participants to tell me what their favourite game is. This question makes quite a few of the participants feel uncomfortable. 'When was the last time I played a game? I don't know any games.' Around 25% of them play computer games, and in a group of twenty people, there are always one or two who dislike games in general.

This makes gaming with professionals all the more engaging, interesting and effective. Serious games are effective because they take the professional, the manager and the student out of their comfort zones. Our all-so-familiar world is suddenly viewed from a totally new perspective, and discussed in a new and unfamiliar language: the language of games. Look at your own organisation through the lens of a game: what are the rules? Who are the players? What is the story? How do I know that I am doing well? When do I win? Suddenly, the managerial world – with all its charts, task descriptions, plans, targets, key performance indicators and dashboards – comes to life. *If you think you can do it, prove it. Play it!*

A take-home lesson is that we cannot measure the quality of serious games on the basis of the artwork, gaming technology and number of downloads alone. Serious games can be reviewed only by the professionals who play them. *It was much better than*

FIGURE 10 PLAYING GAMES WITH NON-GAMERS (COURT MANAGEMENT GAME, 2004)

I expected, actually quite nice; I discovered that I do like to play games. I now understand the decisions we are facing! I think we are ready to do it in real life. Or: *I think I need to take another serious look at our strategy.* And so on. For me, this is what it means to achieve deep impact with serious games.

The use of games and related technologies, such as VR and AR, for decision-making and policymaking is now relatively well accepted, especially in the Netherlands. In the corporate sector it is known as 'business war-gaming': if generals do it, why not corporate, political or societal leaders? One of my colleagues uses his experience as a former officer in the Royal Dutch Marine Corps to prepare companies for a confrontation with opponents in the market. Corporate CEOs and their support staff are exposed to a military game format packed with terms such as 'plotting the battlefield', 'red and blue teaming' and 'attacking existing plans' [35].

Virtual and augmented reality will have profound impact on organisations. Organisations need to become playful in order to use these technologies.

A serious game was played at the nuclear summit in The Hague in 2014, where President Obama actually had to persuade Bundeskanzler Merkel to take part [36]; she did not want to play. There is certainly a cultural dimension to the acceptance of serious games for organisational decision-making and policymaking. Play, for instance, requires a certain tolerance for failure, a level playing field and equality among the players. Have you ever played golf with your boss? Who wins? Or rather, would you let him (or her) win? Now imagine a different type of organisation, in a different country: France, Turkey, Brazil, China, or North Korea. Who would win?

Many organisations are quite far from having the conditions required for meaningful play. These organisations are hierarchical, risk-avoiding and formal; everything is fixed in procedures and rules. The implementation of gaming technology, VR and AR in such organisations is likely to cause friction and tension. True imagination does not come from the gaming and VR technology alone, but from the activity of playing. In an environment where games and gaming technology are becoming more pervasive, organisations need to learn how to play. They need to become playful organisations [37].

I believe that theory on what makes organisations 'playful' connects well to other areas of research and innovation in our university, such as 'design thinking' and 'imagineering'. Now I want to focus, however, on how we can use games to boost the performance of teams, organisations and complex systems.

Teams

Watch and listen to teenagers playing online multi-player games. My youngest son, Tristan (14), loves to play CALL OF DUTY: BLACK OPS online with his friends for hours on end. The game requires a rich and complex degree of coordination and leadership. Imagine what kind of team members and leaders these teenagers will become. This question is highly relevant for the performance of organisations, because young gamers will soon become entrepreneurs, managers and corporate, political and societal leaders [38].

Serious games and virtual environments are increasingly being used for training and assessing teams, such as on-scene command teams, surgical teams, control room operators, cabin crews, and so on. In the future, we will see more applications with a wider range of uses, with VR and AR technology. Despite this, we know very little about how teams perform in serious games, and how this relates to their real-world performance.

When there is a car crash in a tunnel or an explosion on an industrial site, the officers who arrive from the emergency services form what we call an on-scene command team. In an excellent doctoral thesis under my supervision, twenty such teams undertaking VR training exercises were observed with video cameras, and analysed using social network indicators such as network centrality and density [39]. The leading question is: what makes high-performing teams different from weaker teams? Do they co-ordinate less, or differently? Understanding this will help us to improve their preparedness and contribute to the quality of on-scene command teams. This can save lives and money.

The study produced too many insights to report here, of course. One counter-intuitive insight, however, is that high-performing teams engage in less – not more! – co-ordination during the intermediate phases of emergency management.

In another study, we used a serious game called TEAMUP for team training and assessment. In the game, four players need to work together in order to solve five levels of puzzles [40]; something that requires good communication and leadership. We found that some in-game scores – such as avoidable mistakes – are a strong and significant indicator of team-quality aspects such as team cohesion, whereas others, such as 'time to complete the game,' are not. This is important, because we now have a better understanding of which indicators to use for team assessment and learning.

The use of games and gamification for personal and team assessment is expected to grow. In the AMELIO project – a collaborative project between NHTV students and staff and the DAF technology lab at Tilburg University – this is being taken to the next level.

Collaboration in mixed reality

In order to use VR for training and meetings, users should be able to interact with each other by talking, writing, gesturing, exchanging, and so forth, in the immersive world. At the same time, they need to be able to interact with the VR world itself, something that current technology hardly supports. Furthermore, there are very few experimental set-ups where we can measure the quality of collaboration in VR.

For this reason, a team of NHTV IGAD students developed a collaborative game for the fully immersive VR environment provided by the DAF technology lab at Tilburg University, the Netherlands. In the lab's Experience Room, eight projectors deliver razor-sharp 2D or 3D images onto all four walls. Advanced monitoring systems – bio-sensing, sound, speech and movement – will soon be installed, so that it will be possible to track and store an enormous amount of data on individual players and groups.

FIGURE 11 COLLABORATION IN MIXED REALITY (NHTV, STUDENT PROJECT FOR DAF TECHNOLOGY LAB, 2016)

The AMELIO game is a team challenge that has been loosely based on the concept of an escape room. Three to six players find themselves locked in the control room of a space colony in an emergency situation. The sounds and flickering lights of a short circuit indicate that players should try to the restore electricity supply. Entering the game, the players have to figure out that they need to place a red and blue fuse back in its socket by using motion-tracked controllers and wand remote controls. This restores light on the colony and opens the window blinds, giving the players an amazing view of a red, oxidised terrestrial planet. They are now able to operate the holographic control panel of an elevator. This takes the players to the next level, where they will need to solve another puzzle, and so on.

As they are inside the same room, the players communicate face-to-face, but they also have to coordinate various tasks conducted by different player-roles in the virtual world (VW). The commander leads the team and operates a small searchlight that is attached to his glasses. Using stereoscopic glasses, two or three scientists are able to see a little more information in the VW, such as directional signs, than other players. Two or three engineers use controllers to move around and control VW objects.

Developed in close cooperation with a business school, the game is a test bed for real-life applications in collaborative mixed reality and team training and assessment. It will provide a wealth of data and insights on how teams collaborate in games and how this relates to real-life performance. It will help organisations to experience immersive game technologies and reflect on their strengths and limitations.

Organisations

Let us now move from the level of teams up to the level of organisations. Can an organisation as a whole learn more, or learn something different, than all its individuals put together? Can serious games support organisational learning?

Gaming is organising! As inexperienced gamers, when we are new to a game, we have no idea what to do or where to go... We cannot get anywhere by trying to figure out a game without doing anything. We need to do something, such as walking around or picking up an object – even if we fail many times and have to keep trying.

Gaming is organising. It is rooted in experiential learning, single and double-loop learning and sense-making

We walk around and see a tile on the floor. We step on it and a fire becomes lit around the tile. A door opens. I start to assign meaning to actions. I step on a tile > fire lights. Then I formulate an action theory. When I want to open a door, I should step on a tile. Let's try. Yes, it works. My theory seems to be correct.

This is Kolb's well-known experiential learning cycle [41].

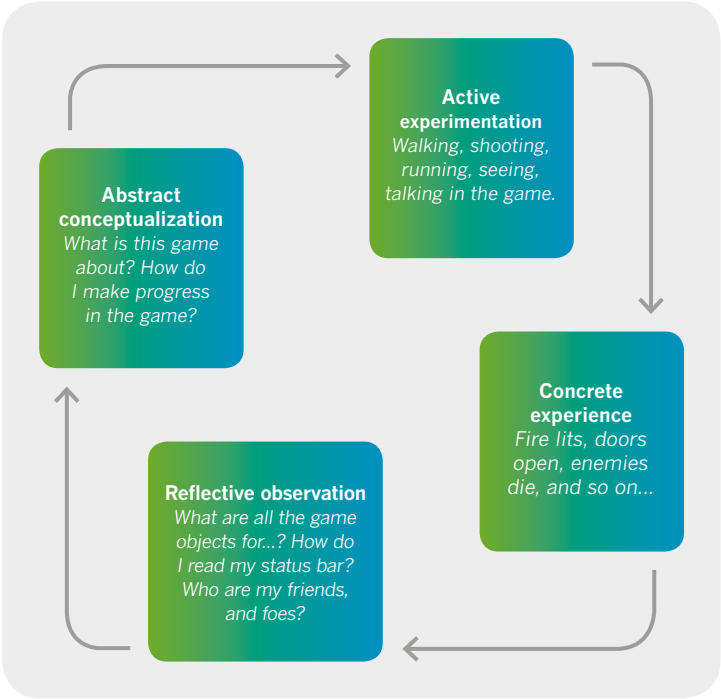


FIGURE 12 GAMING AS EXPERIENTIAL LEARNING (KOLB, REWORKED)

Organisational theorists argue that through experience, we develop a mental frame – a model, a scheme – on how the world works. This frame colours our perception of the world, and we use it to communicate with others.

In organisations and multi-player games, players need to communicate and co-ordinate their actions. To open a door, two players need to step simultaneously on tiles to the left and right sides of the door. They communicate about actions, consequences and theories. If there are no words yet, because the world is new and strange, they need to invent them. The players develop a shared mental model.

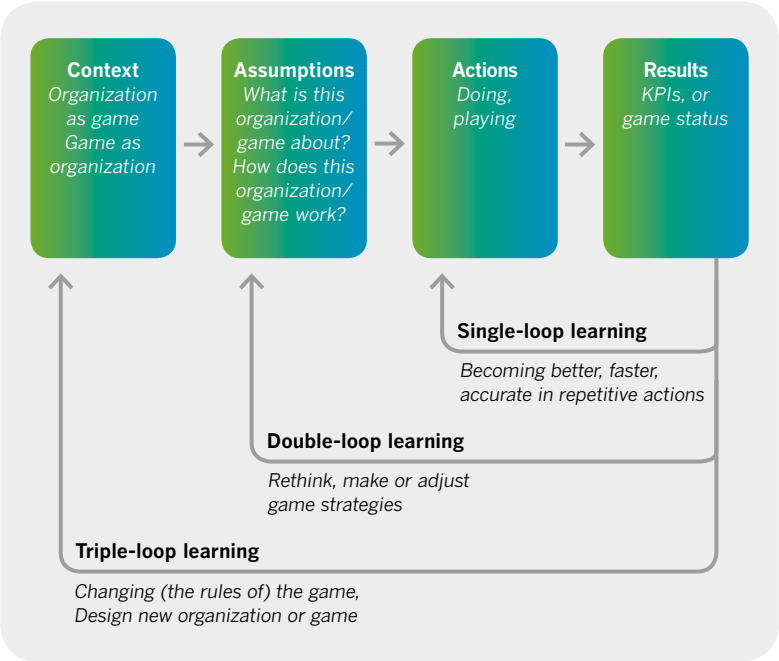


FIGURE 13 GAMING AS SINGLE, DOUBLE AND TRIPLE LOOP LEARNING (ARGYRIS, REWORKED)

Many things can go wrong, however. There can be inactivity: some players may simply not try hard enough. There can be premature closure: some players may try a few options, but not all of them, and prematurely conclude that there must be an alternative course of action, taking the organisation down the wrong path. Or there may be false inferences: one or more players may develop a flawed theory. The action might work, but for other reasons than the players think. False theories tend to have staying power, especially when they are proposed by a dominant leader. For this reason, there needs to be enough openness in an organisation to challenge the theory and its exponents. In this sense, games are a great way to develop, explicate and test mental models, as well as to enhance communication and leadership.

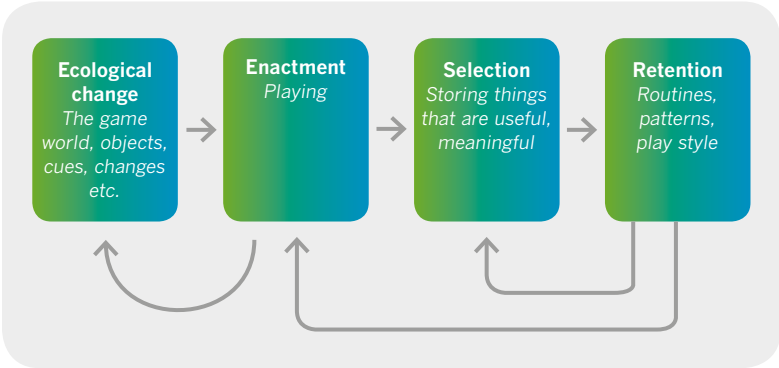


FIGURE 14 GAMING AS ORGANIZING AND SENSE-MAKING (WEICK, REWORKED)

Initially, the players simply become better at basic activities such as navigating, running, picking up objects, shooting, and so on. They become more skilled – quicker, more accurate – at doing the same, familiar things. In multi-player games and organisations, however, players will soon notice that they cannot progress simply by becoming more skilled. They need to restructure their game-play; and this is where they go from single loop to double-loop learning to triple loop learning [42]. The players start to reflect on how they have organised themselves, and whether this could be changed or improved. Now, individual learning becomes organising: the players create structures, such as hierarchies, procedures and norms that guide their actions. In his organisational theory, Karl Weick turns the notion that in organisations *'we think and plan, before we act'* on its head [43]. According to Weick, we *do* first, and only afterwards do we give meaning to what we have done. This leads to all kinds of strange phenomena in organisational life: 'We leap before we look'; 'We shoot and then aim!'

How can I know what I think until I see what I do?

For gamers, this does not feel strange at all. *You move around the game world in order to pick up the cues and make sense of it.*

But you can only know what things are by playing with them. You select and store the things that you find interesting and seem to work best. These are the things that become meaningful. Then you develop routines, strategies, and so forth, which become a pattern, let's call it a style, of play. But now your style of play determines your relationship with the game world, such as the nature of your friends and foes.

Organisations are constantly picking up signals from their environment, filtering them and giving meaning to them. Weick calls this 'sense-making'. What is important and what is not? Important signals and actions are recorded (retention) in procedures and rules. They form the basis for the thing that we call organisation.

Procedures and rules tend to become ends in themselves, however; many industrial accidents, for instance, are caused not by a lack of rules, but because the rules that did exist had lost their meaning. They were trusted and followed mindlessly, while alarming signals were not picked up or ignored. Organisations need to learn how to improvise. This can be learned by playing.

Games are a great way to re-activate sense-making in organisations [44]. The organisation is placed in an unfamiliar story where the rules and players are different. Nothing can be taken for granted, and the signals from the environment are no longer self-evident. Now the players need to *do* before they *think*.

Following Argyris and Schön [45], the possible discrepancy between 'theory in use' (what we do) and 'espoused theory' (what we say) can be highlighted through a game. The players find out that they themselves and others do things that are at odds with what they say they are doing or will do. This is particularly important when preparing for imminent change.

Let us consider a situation where an organisation is preparing to

implement a plan. Will all the players do what the plan says they should do? If all players start to act, what cumulative effect will this have? And if there is a deviation from the plan at some point, how will it be possible to return to the desired state? What if the deviation is so great that the organisation descends into crisis? 'What if...?'

Business readiness

A recent innovative example of how we can use games to answer 'what if' questions such as these is the *Smart Meter Business Readiness game*, which was recently designed for a grid operator in the Netherlands.

First, let me give a little context. In the Netherlands, like in other European countries, a political decision was made to install so-called 'smart meters' in all households. This should contribute to energy savings and the transition to sustainable energy production. Smart metering makes it easier for grid operators to keep track of the amount of energy that is consumed, generated and supplied back to the grid.

The implementation of smart meters by grid operators is a major operation that will be carried out between 2016 and 2020. Millions of home-owners have to be informed about what smart meters are, why they are being installed, what is expected of them, and what their rights are. Home-owners need to agree to the free installation of the smart meter, but they can also refuse. At the grid operator's back office, smart meters need to be ordered, calibrated and put in stock. Legal and financial contracts with contractors need to be concluded; logistics need to be managed; technical problems have to be solved. Moreover, -there is always a risk of incidents and accidents. In short, the operation involves thousands of technical and management procedures, detailed in schematics and plans

FIGURE 15 SCREENSHOT OF THE SMART METER BUSINESS READINESS GAME

that are packed with technical and economic data and performance indicators. The actions of departments, managers, operators and external stakeholders need to be aligned and coordinated.

How does it all fit together? Indeed, *does* it fit together?

The board of our client company decided that one good way to find out would be to play a game. Over five months or so, a mixed team of specialists from the client organisation, NHTV and Atlantis Games developed an innovative combination of role play (the story and roles), simulation (of the main procedures) and gamification (a performance dashboard of key performance indicators). The game was then played with about hundred senior managers from all of the relevant departments and layers in the organisation. The results are too detailed to share here, but the players acknowledged that the experience had greatly contributed to their understanding. Although there were many points of discussion and reflection, playing the game contributed to the feeling that they were as ready as they could be.

Systems

Let us now step from the level of the organisation to the systems level. Can games support the management of complex systems in a socially beneficial way?

The human brain, a team, an organisation, logistical chains, infrastructure networks (roads), urban areas (cities) and geo-systems (rivers, oceans): these are all examples of what we call 'complex systems' [46]. The management of complex systems is the overriding challenge of our time. How well we manage such systems will determine our safety, our well-being and our very existence; in the face of climate change, for instance.

A complex system is made up of numerous interconnected elements, which together form subsystems that create the super-structure of a system. Complex systems show behaviour that cannot be explained with reference to the system's elements alone. This is called 'emergent behaviour': 1 + 1 > 2. A road system, the Internet, the ocean: each seems to have a life of its own.

Playing is the way in which a complex system prepares for change. It is learning by anticipation.

The theory of Complex Adaptive Systems (CAS) states that rather than being sealed off, systems constantly exchange information with their environment. If there are any changes in the environment, the system needs to adapt. An inability to adapt can lead to the collapse of the system, just as the inability of the polar bear to adapt to climate change is likely to result in its extinction.

I believe that playing is the way in which some complex systems – animals, children, managers, organisations, chains and infrastructure networks – anticipate and prepare for possible change. Through play, the system tries to assess whether change is

needed, whether this is a good time to change, what might happen when change does occur, whether the system will be able to change when it needs to, and so forth.

Playing is learning by anticipation.

This is necessary, because intuition is a particularly bad at predicting the behaviour of complex systems. Simple rules of behaviour can lead to surprising results; the swarm behaviour of fish and birds, for instance, or the self-organising chaos of traffic in India.

We can therefore use simulation techniques, such as system dynamics and agent-based modelling, to understand the behaviour of complex systems. Such simulations have one limitation, however: they cannot cope with the full complexity of human behaviour; the irrationality of our behaviour, and with our beliefs, values and emotions.

In games, though, we are able to capture human social behaviour, because the player is an intrinsic part of the model. A game is the ultimate representation of a complex, multi-actor system.

Games and play can therefore make a significant contribution to the understanding and performance of complex systems. They allow us look into the future, and to develop and assess strategies for getting there.

Ocean management

There could hardly be a more convincing example of the importance of complex systems than the ocean. Since 2011, I have had the great pleasure of using the best of my gaming expertise for the cause of ocean management.

Let me first provide some background. In 2014, the EU member states approved a directive on Maritime Spatial Planning (MSP).

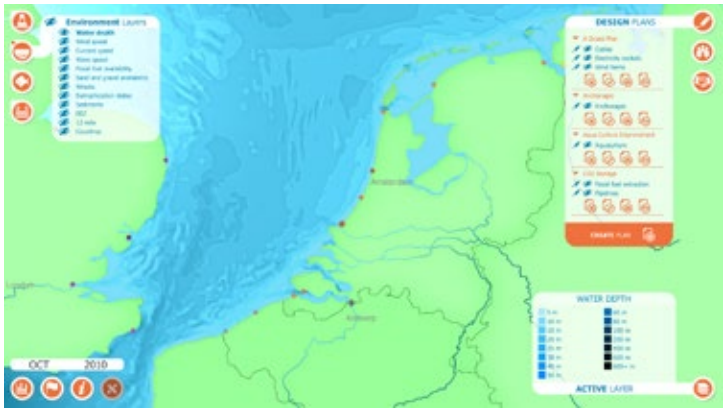


FIGURE 16 SCREENSHOT, MSP CHALLENGE 2050

This requires member states to make an initial ecological assessment of their waters in respect of each marine region or sub-region, and then define measures, including MSP, to achieve a 'good environmental status' (GES).

EU countries have been asked to develop and use tools for planning human activities at sea, such as wind-farming, shipping, fishing, dredging and oil and gas extraction. At the same time, countries need to protect the marine ecology. They need to find a way to work together and with numerous stakeholders that have conflicting interests. What is more, planners are faced with numerous scientific studies pointing in different directions.

That is why we started to use gaming.

In the early summer of 2011, we were asked by the Dutch Ministry of Infrastructure and Environment to develop the MSP Challenge; a kind of multi-player SimCity for the North Sea. It is a computer-supported, role-playing game that gives maritime spatial planners insight into the diverse challenges presented by the sustainable planning of human activities in the marine and coastal ecosystem.

FIGURE 17 PLAYING THE MSP CHALLENGE BOARD GAME AT THE SCOTTISH COASTAL FORUM (MARCH, 2016)

By developing the game, we wanted to contribute to policy learning and international planning practices on integrated (eco-based) maritime spatial planning. The MSP Challenge 2050 has since been played around twenty times in various locations in Europe, by policymakers, experts and Erasmus Mundus students [47].

The computer version of the game takes one or two days to play and has quite a complicated set-up. We therefore developed a one-hour, strategic table-top version. This board game was played with success at a high-level meeting of the 2016 Netherlands EU presidency and at the Scottish Coastal Forum. It is used as a 'step in' model for the full MSP Challenge 2050, and has a very powerful learning effect.

The MSP community is adopting the game. Those professionals who initially showed some reluctance are now appreciative of it. We have noticed that the game-play is transforming the use of words and concepts. Those who have played the game refer to its dynamics, patterns and lessons when they are talking about reality. The game is influencing ideas on decision-support and collaborative planning. In short: the community is starting to look at MSP through the lens of a game.

At the end of 2015, the MSP Challenge became part of two INTERREG projects, NorthSEE and BalticLINES, thereby broadening the game's support-base to include the whole of the North Sea and Baltic regions.

In the coming years, the game will lie at the very heart of a policy network consisting of ministries, knowledge institutes and stakeholders all over Europe. It will help to shape transnational coordination in MSP in the North Sea and Baltic regions. It is anticipated that the game will be played many times a year, in different regions, by policy-makers and stakeholders.

In order to achieve this, we will further develop the software and models to make the game more realistic. Working closely with other universities, we will study the deep impact that the MSP Challenge has on policy learning and transnational coordination in MSP.

Implications

In view of everything that we know about serious games, what are we able to do?

(1) We can look at teams, organisations and systems through the lens of games and play. We can develop theories that link games and play to organisational learning and change.

(2) We can inform and prepare teams, organisations and systems for new and emerging game technologies, because it is likely that these will have a profound impact on their core business.

(3) We can learn organisations how to become more playful in using game-technology.

(4) We can evaluate the design and use of serious games more critically and develop data collection tools to collect data for evidence and analysis. What works, and what doesn't?

(5) We can relate game experiences and game performances to the performance of leaders and teams in real life.

(6) We can develop and use innovative game formats that enable organisations to play out their strategies and plans before they are implemented, and we can assess their impact.

(7) With games, we can contribute to the understanding and management of complex systems, such as spatial urban development in Brabant or elsewhere, sustainable urban tourism and the management of the oceans and other ecosystems.

And I am sure that we will be able to do much more.

Conclusion

If we want to become excellent in the area of games, we need to understand and work with a variety of entertainment games, serious games, digital media and virtual reality. This will enable us to create new, original combinations.

I believe that we can make a significant contribution to innovation in games. We have all the resources to hand; we just need to dig a little deeper. We need to work together, across different disciplines. And we need to make ourselves and our students aware that amazing things can be achieved with gaming technology, within and beyond the entertainment game industry, for the good of society.

Acknowledgements

I wish to thank all the individuals and organisations that have contributed to my ideas, games and publications over the last twenty years or so. I would need at least another 30 minutes to mention all their names.

I am grateful to have found a new home at NHTV University of Applied Sciences. It's an intellectual and creative home, but above all it feels warm and playful. I would like to thank the management of NHTV, especially Hein and Daphne, for their trust and support. I am looking forward to working in this pleasant atmosphere with my fellow professors, Marnix van Gisbergen (Media) and Mata Haggis (Entertainment games). And, of course, with all the real gamers at IGAD: the staff and students. I believe we can build bridges in academia. We all need to become game designers!

I have been immensely impressed by the IGAD students and what they are able to achieve. I hope that they will let me encourage them to explore the area of serious games and work with me.

Lastly, I simply want to thank my closest family – my wife and children, my parents and my sisters – for everything they do and all that they are.

That's it. Thank you for listening.

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Digital Media and Games at NHTV – Experience, Innovation and Research

With three inaugural lectures, NHTV's Academy for Digital Entertainment (ADE) is putting the Centre for Games & Digital Media on the map. The centre promotes, coordinates and conducts research and innovative activities in the areas of games and digital media, with a focus on 'engaging playful experiences' in 'Digitally Enhanced Realities (DER)'. It designs and studies engaging playful experiences for their intrinsic capacity (for entertainment and fun) and for their impact (learning, change). The centre works on 'the creation and research of experiences'; affiliated designers create (or imagine, design, make and produce) new experiences in the form of innovative game and media concepts and playable prototypes, right up to the development, production and market launch of games and media products and services. What is more, the centre studies playful experiences experientially: in lab experiments, field labs and pilots, through real-life interventions, and through the observation of behaviour and cultures in online games and media.

Digital Media Concepts – The *digital media research* area is entitled 'Contextual Connected Media' and has a focus on virtual reality. It uses media context as the guiding principle to measure, explore and understand the functionality and role of virtual reality. In doing so it provides a framework against which organizations can create virtual reality concepts and media strategies designed to engage and reach audiences who do – or do not – move across different media platforms.

Creative and Entertainment Games – The *creative and entertainment games research* area is entitled 'Understanding the shaping of identities and worlds in creative and entertainment games'. It examines the discourse between players, DER, and the social and historical contexts in which games are played. It does this both from the approach of cultural criticism and technological

investigations, looking at the relationship between gaming artefacts and player experiences.

Serious games – The *serious games research* area is entitled 'Playful Organisations & Learning Systems'. The ambition is to design and study the impact of games – their concepts, principles and technology – on team performance, organisational effectiveness and the management of complex systems, for the good of society.

COLOFON

Playful Organisations & Learning Systems

Igor S. Mayer

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