The role of play

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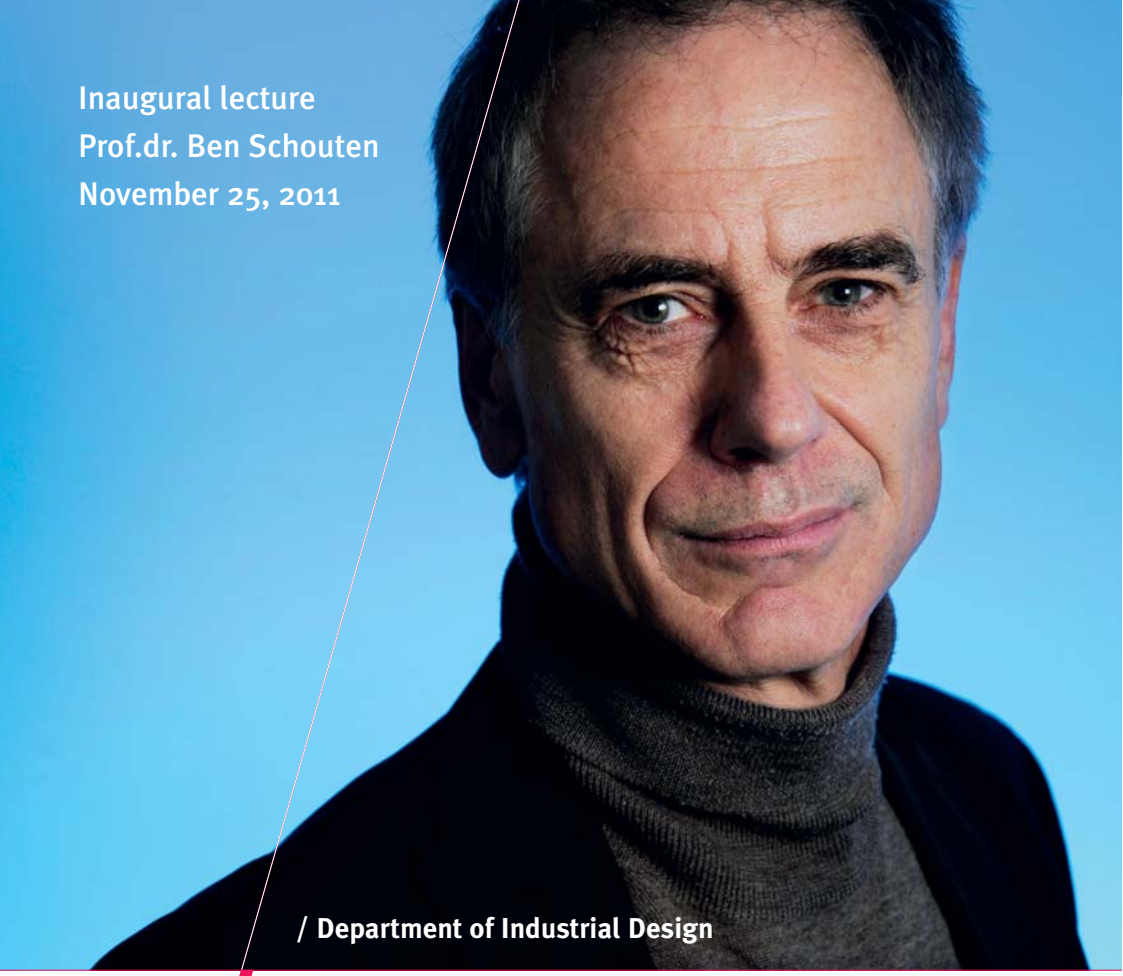

/ Department of Industrial Design

TU/e Technische Universiteit **Eindhoven** University of Technology

The Role of Play

Where innovation starts

Inaugural lecture prof.dr. Ben Schouten

The Role of Play

Presented on November 25, 2011
Eindhoven University of Technology

1 Introduction

The story I am going to tell in this inaugural lecture starts with my work as a professional artist in 1983. In that year I graduated from the Gerrit Rietveld Art Academy in Amsterdam. As for many artists everyday reality, a coincidence was often the starting point. It could be the news that I teleported to an interactive garbage can, see Fig. 1, to comment on its content, or a series of portraits shown on an urban screen, originating from match.com and unfolding a modern portrait gallery, see Fig. 2. More important then the reality itself was the experience it created. Although the simple fact or occasion was clear, the perception can differ depending on the context.

One of the reasons to become an artist is to dream, Fig. 3. Reality, in many cases, is just boring. It is in the imagination that ideas and challenges are shaped and plans are made, at least that is how it works for me. That to me is the essence of play: to be curious, to explore and to create. Not knowing where your ideas might lead you. Shirley Turkle in her book *Life on the Screen: Identity in the Age of the Internet* (1995) describes it as follows: "If there is no underlying meaning, or a meaning we shall never know, the privileged way of knowing can only be through exploration".

The construction of something new by exploring the existing, is inherent to play (Deen, 2010). Sutton-Smith (2001) argues that play is a working model of flexibility. He defines play as an activity that is voluntary, intrinsically motivated, fun, incorporates free will/choices, offers escape, and is fundamentally exciting. The utilitarian activities of play are well underlined by Brock (2009) et al. In *Perspectives on Play, Learning for Life* (2008), they outline a vital link between play, psychological development and educational practices. They provide an interesting and complete list of 'Theories of Play' from 1805 onwards, focusing on Play as instrumental for learning, self-regulation, rehearsal, levels of involvement amongst others. Mary Flanagan underlines the importance of what she calls *Critical Play* to resolve fundamental questions in life and/or society (Flanagan, 2009). Schouten et al. (In Press) underline the growing role of play and games for the (re)construction of social practices, values and identity in post-industrial society. As well as utilitarian and goal-oriented properties, play also has

non-utilitarian and autotelic (purpose lies in itself) properties. Also playfulness[1] can be associated with casual leisure activities (Stebbins, 1997). Such activities often develop on the fly, without having *a priori* goals for what exactly should be completed or performed.

Play, in its contemporary and digital form, for instance through games, social networks, 'apps' on smartphones, interactive toys or art, is an important activity in modern life. As an example I would like to mention the work of art you just saw when you entered the lecture room, see Fig. 4, called *Dune* by Daan Roosegaarde (2007): a public interactive landscape of light that interacts with human behavior, a hybrid of nature and technology. An art piece that makes you want to be an artist (again). Another example of the role of play is the use of serious games[2] for collaboration and co-creation, targeted towards healthcare, design, urban planning, science a.o. Worth mentioning is the online game *Foldit* (2011) Fig. 5, that is designed to reveal the shortcuts nature uses to weave a tangle of amino acids into a protein. Other examples are the construction of 3D images of street scenes or the exploration and classification of solar systems (*Galaxy Zoo*: www.galaxyzoo.org). These games are called 'Citizen Science' games as they are based on user participation and 'Wisdom of the Crowd'[3], and show only some of the possibilities of modern gaming.

As you can see from these examples, play is omnipresent. Play represents a way in which experience shapes development. Historically seen, according to Huizinga (1950) play is primary to and a necessary condition of the generation of culture. That is also one of the reasons, why this inaugural speech is addressed to you at the symposium entitled *Playful Post Digital Culture*, which is a part of the STRP Festival 2011: *50 years Dutch Media Art, a Retrospective*.

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[1] The word play is a verb that indicates that it has a purpose in itself; whereas playful is an adjective that indicates that it is coupled with another word like interaction. In this case it is an attitude or approach to another activity than play itself. The difference between playfulness and play can be looked upon as a continuum, which has playful (as an adjective) on one side and play (as a verb), as the main activity, on the other side. It indicates that playfulness can be a minor approach, which is less structured and less goal-oriented, as part of another activity that can have more components of play integrated in it.

[2] Serious game design has a primary purpose other than pure entertainment. I rather use the word Applied Game Design as it better expresses the utilitarian aspects.

[3] 'Wisdom of the Crowd' refers to the networked aggregation of information within groups, under the assumption that such decisions are often better than those that could have been made by any single member.

In the chair *Design of Intelligent Systems for Playful Interaction* we focus on the emerging field of play design, being subject of research and educational practice in the Department of Industrial Design at the Eindhoven University of Technology. In this inaugural lecture, I will illustrate the role of play with a series of 8 examples (from students, researchers and others) in designing intelligent interactive playful toys, games and entertainment applications. For now, we will define playful interaction as any (human-computer) interaction that has play as part of another activity or is autotelic at its core. Using the above definition, most computer games are examples of playful interactivity, regardless of whether the users playing them are goal-oriented in their efforts. However, the scope of research is much wider than the domain of video games: to acquire knowledge about designing for playful interaction and to develop playful innovations for a diverse group of users, such as children and older adults (among others). Research in this relatively new field of play design is not only grounded in design, art and technology, but also in social sciences and the humanities, and as such highly interdisciplinary.

This lecture is organized as follows: first I will present a historical analysis of the design for games and play (Section 2). In the remainder of the lecture I will then discuss the vision within our theme of Playful Interaction (Section 3), as well as the future plans for research and education (Section 4).

2 Start to Play

The predecessor of all console game genres is considered to be the ball-and-paddle game called *Pong*, see Fig. 6. In 1973, after the success of the original Pong arcade machine, an Atari engineer by the name of Harold Lee came up with the idea of a home Pong unit. Pong could be played on your home television set. Many of the concepts from arcade video games were ported by Atari to different consoles. The *Atari 2600*, released in 1977, is the first successful video game console to use plug-in cartridges instead of having one or more games built-in. It was the *Atari 2600* that kick-started the mass market we know today.

Many of the earliest video games were action games. *Donkey Kong*, an arcade game created by Nintendo, released in July 1981, was the first game that allowed players to jump over obstacles and across gaps, making it the first true platformer[4]. It therefore added a spatial dimension to the concept of play, the so-called *game space*, see Fig. 7, a virtual space in which gamers can join, act and navigate. This game also introduced *Mario*, an icon of the genre. Mario paved the way for more advanced forms of interaction and ludic activity. Role-playing video games (RPG) draw their gameplay from table to role-playing games like *Dungeons & Dragons*. Most cast the player in the role of one or more 'adventurers' who specialize in specific skill sets (such as melee combat or casting magic spells) while progressing through a predetermined storyline.

In the mid to late 1990s, massively multiplayer online role-playing games, or MMORPGs, emerged as a commercial, graphical variant of text-based MUDs (multiplayer real-time virtual worlds described primarily in text), which had existed since 1978 and involve up to hundreds of players interacting with each other on the same persistent world in real-time. This added the second dimension to the concept of digital play: *interaction space*, allowing more meaningful play as gamers are able to communicate, collaborate, decide and co-create. One of the best-known examples is *World of Warcraft*, see Fig. 8, in which players control a character avatar within a fantasy game world in third- or first-person view,

[4] The platform game (or platformer) is a video game genre characterized by requiring the player to jump to and from suspended platforms or over obstacles (jumping puzzles).

exploring the landscape, fighting various monsters, completing quests, and interacting with non-player characters.

At the same time, artists and designers started to experiment with interactive installations using video cameras, computer vision and projections of video images as well as interactive sound, in order to overcome the limited interaction through keyboard and mouse. In the Netherlands, V2 (Rotterdam), Cinekid (Amsterdam) and the STRP festival (Eindhoven) played an important role in stimulating these forms of unstable media (Post, 2000). An example is *Daisies*, by Theodore Watson (2005), see Fig. 9. In this interactive installation, Daisy flowers are projected on a floor, creating an immersive game experience.

As a consequence of recent technological developments like the 'Internet of Things'[5], contemporary games – or should we say play environments – are supported by advanced interaction based on sensory input, the integration of different modalities, tangible computing and the analysis of human behavior (Schouten, 2011b). An example is *Dance Dance Revolution* and games on the Nintendo *Wii* and Microsoft's *Kinect*. No other post-Pong genre has been as revolutionary in terms of defining the (digital) game space, allowing the blending of real and virtual worlds with the human body as interface, see Fig. 10, 11.

2.1 The Design of Play

In its structure and orientation to goals, play can be divided into two types (Caillois, 2001) that can be placed on a continuum from Ludus, structured activities with explicit rules (game-related), to Paidia, unstructured and spontaneous activities (playfulness). In general, there is a tendency to turn Paidia into Ludus.

This continuum is in agreement with the formal definition of games from Juul (2005) which describes a game as 1) a rule-based formal system with 2) a variable and quantifiable outcome, in which 3) different outcomes are assigned different values, 4) the player exerts effort in order to influence the outcome, 5) the player feels attached to the outcome, and 6) the consequences of the activity are

[5] The Internet of Things refers to uniquely identifiable objects (things) and their virtual representations in an Internet-like structure. The term Internet of Things was first used by Kevin Ashton (1999). Radio-frequency identification (RFID) is often seen as a prerequisite for the Internet of Things. If all everyday objects were equipped with radio tags, they could be identified and inventoried by computers (Magrassi, 2001; EC, 2009), see Wikipedia/Internet of Things.

optional and negotiable. Also Salen & Zimmerman (2003) define games as an artificial conflict, based on rules, with a quantifiable outcome.

However games can no longer be described only as 'formal systems that provide informal experiences', as their rules are no longer fixed. *Little Big Planet* (2011), the 'modding' community, MMORPGs and the advance of user-generated content have shown that the game mechanics[6] of today's games can be changed, and by doing so gaming can become more playful and open-ended (Deen, 2010). In current practice, play & games are a system of communication and continuous negotiation of (role) players within a socio-cultural network of human and inhuman actors (Copier, 2007), which is less focused on rules, goals, objects or environments, but instead describes the relationships between all actors. Through gameplay, players create meaning and social bonds; interactions from which a play experience emerges. The play experience and the related activities are in a constant state of flux. It is in this continuous change that the characteristic of play can be found: humans, objects and an intelligent system in a network of (social) interaction.

Before we show some examples of the design for play, we define the concept of digital play as (an) interaction (space) enabling meaningful play as gamers are able to act, communicate, decide and create. The quality of meaningful play is extremely important, as we will see later. Meaningful play occurs when the relationships between actions and outcomes are both discernable and integrated into the larger context (of the game) (Salen & Zimmerman, 2003). In brief, it is the context that makes play meaningful.

As a first example I like to bring to the stage, pervasive and locative games that explore the real and digital space and use aspects from ambient intelligence[7]. A location-based game (or location-enabled game) is one in which the gameplay evolves and progresses through a player's location. In many cases, location-based games therefore support some kind of localization technology, for example by using satellite positioning (GPS). *Urban Games* or *Street Games* are typically multi-

6 Game mechanics are constructs of rules and feedback loops intended to produce enjoyable gameplay. They are the building blocks that can be applied and combined to 'gamify' any non-game context, see http://gamification.org/wiki/Game_Mechanics.

7 Ambient systems are supposed to be: 1) embedded: many networked devices are integrated into the environment; 2) context-aware: these devices can recognize you and your situational context; 3) personalized: they can be tailored to your needs; 3) adaptive: they can change in response to you; and 4) anticipatory: they can anticipate your desires without conscious mediation.

player, location-based games played out on city streets and built up urban environments (Schouten, 2011b). An example of such a pervasive game is *Geocaching* (2010), treasure hunting with the help of GPS, a popular activity in which players search for hidden caches around the world (see Fig. 12). In more advanced urban games, 'game sets' (playing fields) can be created by the user with Google Maps. This user-generated content is the basis for outdoor games but it is also possible to play automatically generated game sets.

Example 1: Play, Design and Architecture. An urban game adds an extra layer of (inter)activity to its reality space. This can be used for entertainment but also for more serious purposes. In his article 'Tactics for a Playful City', Iain Bordan (2007) mentions 8 such interaction spaces (or tactics): Performance, Media, Uncertainty & Risk, Provisional Identities, Fluidity, Interventions, Play and Emotions.

An example in which this has been put into practice is *World of Citycraft* (WoC, 2010; Schouten, 2011a), an interactive, real-time game which enables users to change the planning and realization of an urban design into a more dynamic, democratic and interactive process in which different stakeholders (citizens, architects, government, citizens etc.) work together having a direct influence on their own direct local environment, see Fig. 13. One could say that these playful activities, support:

- Bottom-up approaches instead of top-down decision making. The game can provide a more open platform for discussion.
- Co-creation, allowing a large audience of users, city planners and investors to participate in the design.
- Iterative Design enabling instant prototyping, virtual and real visualizations, 3D models and printing.
- Wisdom of the Crowd and agent technology where information and decisions can come from many sources.
- Open-ended Play, a more dynamic and balanced way of design, less restricted by fixed rules or regulations.
- An optimal medium to connect the virtual and the real worlds.

Example 2: Social Networks. Human Computer Interaction is often defined in terms of functionality and usability, a solution based view of the world (Polaine, 2011). Interaction in its modern form need not always be functional, as we can experience in social networks in which (instant) meaningfulness is of increased significance. This (instant) meaningfulness can, for example, be established by

playing the same games in social networks such as *MafiaWars*, *PetSociety* or *Restaurant City*, as well as by other activities like Chat, MSN, Skype etc., or by belonging to the same interest groups. In Social Games like *FarmVille,* communities and identities are reshaped through collaborations around certain thematic activities. Within these online games, a friend's value corresponds to his or her instant meaningfulness in the game. Being a friend in FarmVille means being of value. A friend transforms into a sort of commodity, friends become assets to play the game. This directly ties-in with the social rules on social networks, in which someone's popularity and 'value' are qualified by the number of friends they have, see Fig. 14.

Example 3: Social Currencies. Another example is a research project by students in our Department of Industrial Design, assigned by the Foundation for Future Technology (STT). In this project a new more social currency was developed, using Wisdom of the Crowd techniques. This multi-dimensional currency consists of a set of 12 socio-economical values that can be used to label a product, organization or governmental body, and can be 'traded' on a (social) stock market. Apart from economical values, other qualities like: sustainability, trust or transparency are a part of this currency. Users are enabled to value the different aspects of this meta-currency, which is then continuously visualized in a graph, and by doing so an alternative stock market of values can be created. To discuss the implications of the system, our students designed a game that enables the users to explore and discuss the different values, see Fig. 15, 16.

Example 4: Art & Technology. In 1961 the British artist Roy Ascott was teaching at Ealing School of Art. In his paper 'Behaviorist Art and the Cybernetic Vision' (Ascott, 1966) he describes the vision of an environment that calls for user participation in creating an art object. This environment is set up to give feedback, through which the participant engages in a decision-making activity concerning the art object. The end result is the joint creation of the object by the artist and the participant. Ideally this object would be an open project, in constant flow and never ceasing to take on new aspects. With each new participant the creation process would restart or expand, and this circulation would continue until some physical limit (e.g. the end of the exhibition) brings the process to a halt.

Ascott's ideas of 'art as a process' had a great appeal to other artists, as they formulated art as a dynamic system that comes into existence only through the feedback loop between the artist and the audience. In contrast to the traditional understanding of an art object with a well-defined body, ways of construction

(such as painting and sculpture) and a specific space for dissemination (i.e. museums, galleries, fairs), cybernetic art opened the door to a new way of making, experiencing, sharing and displaying art. The concepts of feedback, interaction, information-sharing and 'art as a process' led first to *Telematic Art*, then to *Telepresence Art*, both of which eventually fell under the heading of *New Media Art*, as Electronic Art is called today (Akdag Salah, 2011).

In *Book for the Electronic Arts*, Post & Mulder (2000) subdivide the modern art practice into *stable* and *unstable art*. By stable art they mean the culture of 'high art', driven by the materiality and secularity of art objects. Unstable Art, in contrast, is more volatile, as it is participatory, performative and in constant flux, and is based on (shared) experience. Stable art is serious, unstable art is playful. In modern games and playful interaction, the principles of unstable art are more alive than ever. In Fig. 17 to 20 you can see 4 examples of Media Art as they are presented in Eindhoven at the STRP (www.strp.nl) festival 2011 entitled *Dutch Media Art Retrospective*.

What we can learn from the above examples is that the boundaries between play and production, between work and leisure, and between media consumption and media production, are becoming increasingly blurred (Pearce, 2006). In the future, games and playful interaction will be part of everyday life activity; an approach that can be called upon when necessary as part of existing applications in learning, social networks, healthcare etc. (Tieben, 2011). This requires a social intelligence in game design, and will lead to games that are embedded in systems of social meaning, fluid and negotiated between us and other people around us. Moreover this will require a completely different role of the designer, not being the sole author of the game or play application. In this way, game & play design focuses on interactive products as creators, facilitators and mediators of experiences as well as the creation of opportunities, to put it differently: Play as the experience of interaction.

3 The Role of Play

In this section I would like to discuss three leading design values which we practice within the theme of playful interactions for intelligent systems: playful interaction, ambient game design and open-ended play.

3.1 Playful Interaction

Within the domain of (industrial) design, play is often used as a persuasive technology, for example to stimulate physical and social activities. Persuasive technologies have been used for various purposes (Fogg, 2002), ranging from digital health coaching and computer games that help reduce children's dentist anxiety, to technologies that influence the buying behavior of consumers on e-commerce websites. Interactive interventions that stimulate young people to be more physically active are yet another application of persuasive technology. But these interactive interventions based on human-computer interaction define interactivity in terms of functionality, a solution-based view of the world based on usability (Polaine, 2010; Nielsen 1993). However, gaming and playful interaction have added an extra dimension of (co-)creation, experience, social interaction and relatedness to interaction design which goes beyond usability and functionality. To understand play in its digital form, the (changing) role of interaction is crucial. In modern digital practices, interaction is based on experiences and communication, which are not necessarily efficient or consistent.

As an example I like to mention a beautiful example *the piano staircase*, an initiative from the *thefuntheory.com* sponsored by Volkswagen. Through this playful environment, people are invited to take the staircase instead of the escalator. The designers turned a subway staircase into a real piano. Many people started to create music by joining the others in activating the interactive steps, see Fig. 21. We call this playful *experience design* (Hassenzahl, 2010). Experience Design is the practice of designing products, processes, services, events, and environments with a focus placed on the quality of the user experience and culturally relevant solutions, with less emphasis placed on increasing and improving functionality of the design.

Another key challenge is the use of artificial intelligence in decentralized systems that enable us to create (open-ended) play environments which make use of different sensors and actuators. The simple fact that the overall play experience can only be partly designed or specified, because it arises out of local interactions is challenging, but also very difficult. What can be designed is the behavior of individual components, and the local interaction rules (van Essen, 2009). However, nature provides us with various examples in which local behavior leads to global patterns (Resnick, 1997). For example, individual birds in a flock use only simple local rules related to nearby birds, which together lead to organized flock patterns. Programs in the *StarLogo* parallel programming environment have shown that giving objects or agents local rules can lead to overall patterns in simulated environments (or microworlds). We translate this idea to players interacting with multiple objects in the real world, and assume that overall play patterns will emerge when players use objects with local interaction opportunities. The main difference with the work by Resnick is that, in our case, the total system not only includes (virtual) agents with predefined and fixed rules, but it also contains both interactive play objects with embedded rules and players who determine their own behaviors which change over time.

Example 5: City Play Grounds (I-PE project). Within another NWO project called *Intelligent Play Environments* (I-PE), we want to make outdoor playing more attractive by integrating aspects of gaming (such as interactivity) into outdoor play objects. These interactive objects respond to the players' behavior and motivate players to be active. The play environments use an open-ended play philosophy that encourages players to create their own games and be socially engaged. The boundaries between game and play design will blur, and rules will emerge instead of being preprogrammed.

Currently, an initial concept called *FlowSteps* is being developed into a first working prototype for an explorative study. FlowSteps consists of a large number of flexible interactive mats that players can use to throw, flip, jump or sit on. Players can create their own games by placing the mats on the floor in any position they like. The design does not communicate a clear function as the embodiment is context independent. FlowSteps provides players with opportunities to design their own play by giving meaning to the output modalities, creating playgrounds that support their diverse forms of play, see Fig. 22, 23.

3.2 Ambient Game Design

A second design principle we like to practice is the philosophy of play as part of daily life activities. As Huizinga (1950) pointed out in his book *Homo Ludens,* people are inherently playful beings. In the definition of Huizinga, play is restricted to a more specific 'time and place', and is therefore separated from ordinary life. Digital play, however, can be more integrated in a spatial, temporal and social sense (Montola, 2005), spinning of from new media, social networks, modern technology and (social) interaction. That is why we think it is necessary to design for playful activities that are seamlessly integrated within our daily lives or in such a way that the boundaries between other activities and play disappear or blur. Opportunities to play are found everywhere and anytime, for example as part of (school) activities, during fitness, at work or many other activities. We will call this *ambient play* (Schouten, 2011b; Sturm, 2011), which is strongly related to the vision of ambient intelligence (Aarts, 2003). Ambient intelligence means being surrounded by 'smartness'. In an ambient intelligent environment, we are surrounded by intelligence enabling to sense who is present, where they are, what they are doing, and when and why they are doing it. At a conceptual level, there is a strong resemblance to the concepts of pervasive games (Fogg, 2002), such as those mentioned previously, and *ambient gaming*, a term that has gained popularity, meaning games that use ambient intelligence technology to provide an enhanced gaming experience, see for example Eyles & Eglin (2008) or Schouten (2008).

Example 6: Healthcare (PlayFit). In 2009 we started a large Dutch research and development project aimed at reducing teenagers' sedentary behavior, called *PlayFit* (Sturm, 2011). In this project our university and Fontys University of Applied Sciences are working together with industry and healthcare organizations. The project focuses on providing playful activities in which being physically active is inherent to fun, in such a way that physical activity becomes an inherent part of the teenagers' daily lives. At the start of the PlayFit project we carried out explorative studies aimed at defining the context and research questions, getting to know our prospective users and collecting best practices for activity interventions. A literature review was conducted on youth, youth behavior, lifespan development and leisure activities, all focused on Dutch secondary school youth. This explorative research led to several interesting insights, which shaped our view on the design of activity intervention based on play design. First of all, many activity interventions for this age group focus on providing information and creating awareness (Ooms, 2008; De Meester, 2009). The lack of successful interventions seems to indicate that this may not be the right approach.

Fig. 1: *Interactive Garbage Cans.* Ben Schouten, 1997. An interactive garbage can, showing stills from television news broadcast.

Fig. 2: *Pelle en Nineta.* Ben Schouten, 2006. Sixty shots imported from 'match.com' and merged into two portraits of man and women that are slowly changing over time (two hours). The portraits are retrieved and composed through a special computer algorithm.

Fig. 3: *New Venus*. Ben Schouten, 1997. A modern sunbed showing Venus with Cupid kissing her, and on one side Pleasure and Play with other Loves; and on the other, Fraud, Jealousy, and other passions of love.

Fig. 4: *Dune*. Daan Roosegaarde, 2006-2010. Dune is a public interactive landscape that interacts with human behavior. This hybrid of nature and technology is composed of large amounts of fibers that brighten according to the sounds and motion of passing visitors.

Introduction

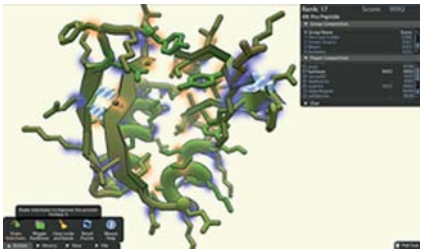

Fig. 5: *Foldit*, University of Washington, 2009. Foldit is an online puzzle video game about protein folding. The objective of the game is to fold the structure of selected proteins to the best of the player's ability, using various tools provided within the game. Scientists can then use such solutions to solve "real-world" problems, by targeting and eradicating diseases, and creating biological innovations.

Fig. 6: *Pong*. Atari, 1972. Pong is one of the earliest arcade video games, launched in 1972 by Atari. In Pong, two players compete against each other in a virtual tennis game.

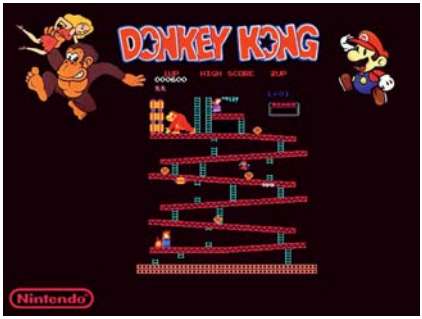

Fig. 7: *Donkey Kong*. Nintendo, 1981. Donkey Kong, launched in 1981, offered a highly improved gameplay compared to other games, leading to a major breakthrough for Nintendo. Mario, the player character, has to evade the barrels to reach and rescue the princess.

Fig. 8: *World of Warcraft*. Blizzard, 2004. World of Warcraft (WoW) is the world's biggest massively multiplayer online role-playing game (MMORPG) with more than 11 million subscribers. In WoW, players control an avatar in a fantasy world, in which they fight, cooperate, compete, socialize, and so on.

History of Games

Fig. 9: *Daisies*, Theodore Watson, 2005. This is an interactive project, Watson originally did for his Computer Vision class at Parsons School of Design (NY). You walk over the daisies and the daisies die under your feet, only to quickly grow back a few seconds later. There is also a 2.0 version that features algorithmically generated flowers.

Fig. 10: *Dance Dance Revolution*. Konami, 1998. Dance Dance Revolution (DDR) is one of the most popular music games. Players have to hit the pattern with their feet, synchronized with music, leading to a 'dancing competition'.

Fig. 11: *Kinect for Xbox 360*. Microsoft, 2010. Microsoft Kinect for Xbox 360 is a motion sensing input device, that translates the player's physical actions into game actions. In this example the player can play volleybal, the human body as interface.

Fig. 12: *Geocaching*. Location-based games, 2000. Location-based games, such as Geocaching, utilize the physical location of the player, often through a GPS module. The real world is the playing field; in Geocaching for example, the player has to find a treasure by moving to the correct GPS coordinates.

Body as Interface

Fig. 13: *World of Citycraft*, The Responsive City, 2010. An interactive, real-time game which enables users to change the planning and realization of an urban design into a more dynamic, democratic and interactive process in which citizens, architects, government, citizens etc. work together (Source: TReC).

Fig. 14: *Farmville*, Zynga, 2009. FarmVille is a farming simulation social network game developed by Zynga in 2009. Gameplay involving various aspects of farm management such as plowing land, planting, growing and harvesting, and by raising livestock. Criticsm includes several expert reports that consistently point out the dangers of addiction and the overall trend of replacing real social interaction with virtual gaming.

Fig. 15: *Social Currencies*. Student Project (TU/e), 2010. Trust model created by wisdom of the crowd. Dynamical 'monetary' system consisting of a set of 12 socio-economical values that can be used to label a product, organization or governmental body, and can be 'traded' on a (social) stock market. Users value the different aspects of this meta-currency, which is visualized in a graph, and by doing so an alternative stock market of values is created. (Credits: van Geel)

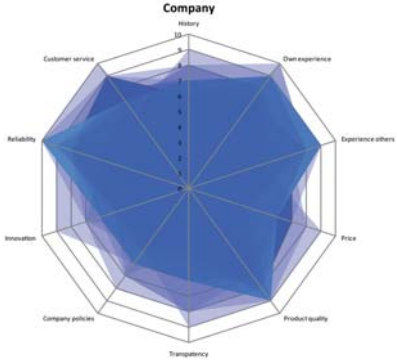

Fig. 16: *Decision Making*. Student Project (TU/e), 2010. Multi-player game designed to explore and discuss sustainability and other socio-economical values in relationship to fair trade and social currencies, see also Fig. 15. (Credits: Siekmans)

Play Design

Fig. 17: *Tarim Machine*. Gerrit van Bakel, 1982. This kinetic object of steel 'runs' on the difference in expansion coefficient (solar energy) of its constituting parts. His sculptures mark the first period in *Technological Art* in which the fascination for technology is a leading principle.

Fig. 18: *Mill X Molen*. Bert Schutter, 1982. One of the classics of Dutch Media Art. Twelve monitors constitute the sails of a windmill. The monitors are fixed, their images show the turning sails under the sound of wind. One of the first spatial video art installations. (Credits: Dutch Media Art Institute)

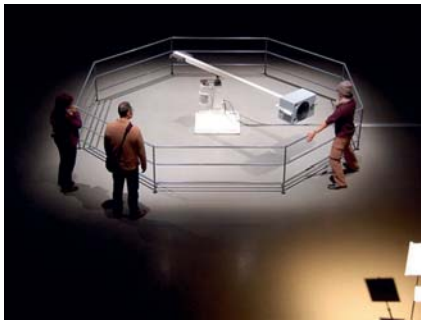

Fig. 19: *Spatial Sounds 100 DB at 100 KM/H*. Marnix de Nijs, 2000. Interactive Installation. A speaker mounted on a rotating arm, scans the room for visitors reacting through sounds more or less following the spectator. A good example of art & play as the experience of interaction.

Fig. 20: *God's Browser*. Geert Mul, 2010. God's Browser is a generative interactive installation that features a film whose every frame is an image taken from the Internet. The user can compose this film (with his hands, interactively on music) and specially developed image recognition software sorts images available on the World Wide Web and places them in sequence.

Playful Culture

Fig. 21: *Piano Staircase.* Thefuntheory.com, 2009. Through this playful environment, people are invited to take the staircase instead of the escalator. The designers turned a subway staircase into a real piano. Many people started to create music by joining the others in activating the interactive steps, an example of *playful experience design*.

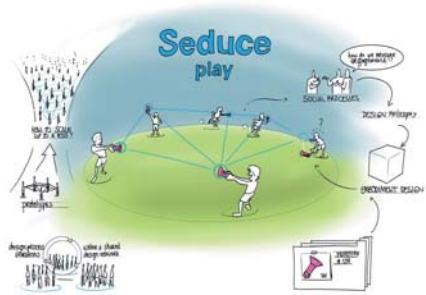

Fig. 22: *Intelligent Play Environment (I-PE).* PhD project (TU/e), 2011. In this national research project, two PhD students research on playgrounds that can support outdoor play by integrating elements of gaming. Rules emerge from interaction instead of being pre-programmed. Depending on the dynamics of play, the system might sometimes act proactive, by providing new interaction opportunities, or sometimes might act more passive. (Credits: Rijnbout, de Valk)

Fig. 23: *FlowSteps.* PhD project (TU/e), 2011. As part of the I-PE project, an initial prototype called *FlowSteps* is developed for an explorative study. FlowSteps consists of a large number of flexible interactive mats that players can use to throw, flip, jump or sit on. Players can create their own games by placing the mats on the floor in any position they like. The design does not communicate a clear function as the embodiment is context independent. (Credits: Rijnbout, de Valk)

Fig. 24: *Dynamic Clothing.* Student Project (TU/e), 2010. Dynamic Clothing is a series of fabric and clothing that changes appearance depending on one's actions. For example, when bending your knee, an aesthetic pattern becomes visible. This combines being active and being beautiful in a novel way. (Credits: Schouren)

Lifestyle

Fig. 25: *Light Scribing*. Student Project (TU/e), 2010. This concept uses light, movement, and a delayed shutter, in order to allow teenagers to 'scribe' with light. The freedom of movement allows creation, expression and exploration in a bodily way. (Credits: Fejer)

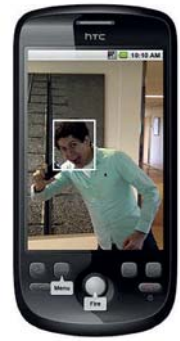

Fig. 26: *Headhunters*. Student Project (Fontys), 2010. Headhunters is a mobile, location-based application where friends can create and monitor challenges for each other, using photographs and face detection. For example, one could create the challenge 'photograph twelve blond girls'. Nominated for the Spin Awards 2010. (Credits: v.d. Bogaard, v.d. Bossenberg, Coolen, Essing, Vereecken)

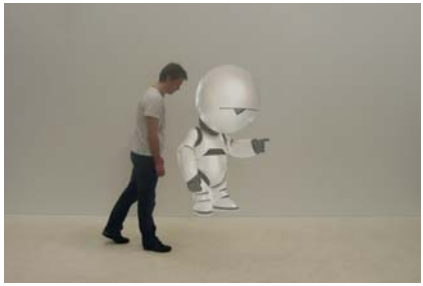

Fig. 27: *Walk-of*-Fame. PlayFit Project (TU/e), 2011. Walk-of-Fame is an interactive installation in the corridor of a school. Teenagers walking through the school are recorded, and their gait is analyzed. The way in which they walk determines which virtual character walks with them through the corridor. (Credits: Tieben)

Fig. 28: *ColorFlares*. Tilde Bekker et al. (TU/e). These play objects change color when touched or rolled and start to flash if you shake them. The toys enable the children to come up with their own rules or game scenarios, which depend completely on the context such as indoor, outdoor or as part of another game.

Open-ended Play

Fig. 29: *Smart Goals*. Smart Goals BV, 2010. SmartGoals is a tool for trainers/coaches to create training exercises focused on those skills that players need to create dynamic gameplay: anticipation, agility, field overview, ball circulation and communication. In a large set of cones, players have to pass through the enlightened ones.

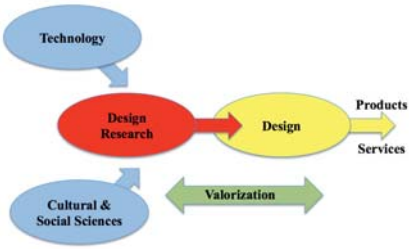

Fig. 30: *Research through Design*. TU/e, 2001. Research in the theme of Playful Interaction is multi-disciplinary: Design, (Social & Cultural) Sciences and Technology are the building blocks for meaningful Play Design. Our methodology is 'research through design' in which iterative design is used to build theory.

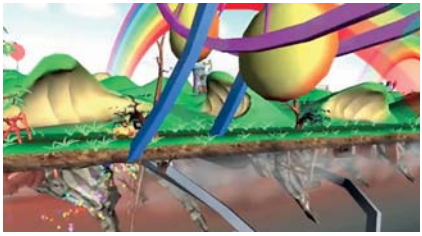

Fig. 31: *Pony Panic*. Games [4Health] Jam, 2011. In Pony Panic, two players compete on two different laptops. At certain moments in the game, they have to switch controls, and have to run to the other player's laptop. (Credits: Decrauw, Ezendam, Hoekstra, van Houdt, Roelofs)

Fig. 32: *Sumo Salad*. Games [4Health] Jam, 2011. In Sumo Salad, four players have to catch different types of vegetables, by moving in front of a camera. Their physical position and movements are translated to the game, leading to a competitive and enjoyable game. (Credits: Bondarev, van Haandel, van Halteren, Hekman, van Hooff)

Research & Business

Other research has shown that interventions of this type may increase physical activity for a while but fail to be effective in the long term, and that the effects of these interventions fail to transfer outside the school environment (De Meester, 2009). We believe that learning by doing is the right approach for this target group. We therefore invite teenagers in fun activities in which physical activity is inherent to the playful activity. In this way, the boundaries between physical activity, play and fun disappear and children are active simply because it is part of the fun. Since play and games are such an important part of the lives of many teenagers, the use of (aspects of) gaming is a vital element of our approach.

Furthermore, we intend to reduce the amount of sedentary time spent by teenagers by engaging them in playful activities throughout the day, rather than only at specific times and places. Finally, we found that our target group is very heterogeneous, representing a diversity of interests and values and showing huge differences between age groups. For an intervention to be successful, it is therefore crucial that it offers something interesting for each individual, and that it can be personalized to match individual preferences. These play scenarios were all implemented at the ROC, the Regional Education Center for West Brabant. Four examples are illustrated in Fig. 24 to 27.

3.3 Open-ended Play

An important design vision is based on the idea that rather than providing concepts with concrete predefined goals and rules, providing interaction opportunities with play objects may lead to interesting and previously undefined goals. The meaning of the objects and interactions therefore only becomes defined in the way they are used. We call this *open-ended play* (Bekker, 2010). These ideas are inspired by the way children play. When two children are playing ‘cops and robbers’ or ‘soldiers’ for instance, they pretend to fight a war. They change the rules every minute, constructing new rules, new goals, new weapons or new worlds. This is play in one of its purest forms. A simple wooden branch becomes a deadly Desert-5 pistol. Seconds later the branch transforms into a devastating M79 grenade launcher by resting it on the shoulder. Breaking the branch in two yields two pistols, with which the children run around Lara Croft style, until one of the children gets bored, and changes the game. The children continuously negotiate about the objects, rules and goals of their game. They change the meaning of the game mechanics and by breaking the branches they actually reconstruct the objects themselves. This way, new activities and new play experiences are created by continuously restructuring the relationships between rules, goals, objects and their environment (Deen, 2010).

These concepts are inspired by theories about situated action (Lave, 1988; Nardi, 1997, Suchman, 1987). Instead of designing for goal-directed behavior, as assumed for example by Norman's action cycle (Norman, 1990), the situated actions model assumes that players do not structure their activity beforehand, but that activity grows as the interaction in the context of use occurs. People are opportunistic as they interact with the world. A digital example of this vision designed in our group is the *Colorflares*, see Fig. 28, that change color when touched or rolled. When children shake the Colorflares, they start to flash. These 'toys' enable the children to come up with their own rules or game scenarios, which depend completely on the context such as indoor, outdoor and as part of another game like 'cops and robbers' or 'soldiers'.

Example 7: A Business Case: SmartGoals. When applying playful principles in a more open-ended setup through design activities, we observe that in many cases, new meanings and business opportunities for the target group could be created. For example, *SmartGoals* is a research project in cooperation with playground developer Kompan. This interactive system of goals (made out of traffic cones, see Fig. 29), constantly changes its configuration (van Essen, 2009). It provides a completely new training experience for coaches and young footballers. Young footballers can learn to keep the ball under control, and become flexible players, who can change tactics at the moment an opportunity pops up. Training activity has proven to be different in this context, and much more effective and fun. The new possibilities of these applications have been acknowledged by several (private) investors, which led to the foundation of the *SmartGoals* B.V. company (see www.smartgoals.nl).

4 Plans for the Future

Historically seen, cultural theorists and historians have described playful interaction from a cultural perspective (Huizinga, 1950). In the 1990s, game theoreticians tried to define play as a new (scientific) discipline (Frasca, 1999; Jenkins, 2002; Aarseth, 2003; Raessens, 2006; Salen & Zimmerman, 2003), different from the perspective of narrativity and with a focus on the gameplay. Human Computer Interaction (HCI) defines interactivity in terms of functionality, a tool-(solution-)based view of the world and usability. However, competition- and goal-based gameplay tend to overshadow the interaction itself, and interaction is reduced to a functional role. In the plans for the future, which we will elaborate below, we want to shed light on our new role for playful interaction, by combining theory, design and knowledge valorization. We will: 1) incorporate research findings and theory from different constituting disciplines, like social sciences to research upon the new role of (digital) playful interaction and 2) put a stronger emphasize on the design practice in order to produce design patterns, principles and guidelines and 3) evaluate the effects of playful interaction as well as the strategies to design them, see Fig. 30.

Our methodology will be based on the principle of *research through design* (Frayling, 1993; Zimmerman, 2007). Unique to this approach is that it uses design artifacts as exemplars to contribute to theory and practice. In its nature it is iterative which means that the different design iterations and evaluations are to improve theory and practice. According to Eric Zimmerman (2003), one of the authors of *Rules of Play*, the creation of games (and play) by a model of research through design is particularly well-suited. In iterative design, there is a blending of designer and user, of creator and player. Through iterative design, designers create systems and play with them. More important it requires a completely different role of the designer, not being the sole 'author' of the playful application or game but designing opportunities to play in open (intelligent) systems of interaction between players. Through this cycle of design and research, designers become participants and, in order to critique their creations, redesign them into something new. And in these procedures of investigation and experimentation, a special form of research takes place.

4.1 Play Literacy

Research in play design is relatively new and in general lacks a consensus of nomenclature, process and categorization. A part of this problem is that each discipline brings its own flavor of meaning to terminology fairly loosely, but commonly and interchangeably used (Polaine, 2010). That is why we would like to emphasize what we call *play literacy* (Zagal, 2010): 1) being able to analyze play in a meaningful way; 2) understanding the experience of play; and 3) knowing how play can be used as an expressive act.

Using the methodology of research through design, we would like to integrate *true* knowledge (models and theories from the behavioral sciences) with the *how* knowledge and the technical opportunities (Zimmerman, 2007). Fundamental research topics for the future are the psychology and motivational aspects of play. In many case, players are so engaged in play that the notion of awareness of real time and space disappears. This type of concentration is often called *flow* (Csikszentmihalyi, 1996). The question, however, is whether players in this state of mind are intrinsically motivated, which is often used as an argument for the success of play & games. The knowledge of human motivation and cultural context is key to creating an enduring play experience ads as such for our research. It is often claimed that play & games are successful in domains like healthcare, management (a.o) due to qualities like competence, autonomy and relatedness (Ryan, 2000). However, the fast growing practice in game & play design has shown that the expected effects on education, healthcare and other domains are not well understood (Deen & Schouten, 2011; Tieben, 2011).

4.2 Design and Validation

It is my strong believe that we should emphasize more on the actual design of systems, services and products in the forthcoming years. To strengthen the input from industry and society, as well as the quality of design, I would like to start working in my group, with so-called *designers in residence*. These designers can originate from industry or can be independent designers, and will enhance the quality and applicability of our designs. In order to practice the above, and to better understand the effects of playful interaction, we are currently building a *playlab* in which design and validation are central issues. This lab will allow prototypes to be evaluated, to measure the effect of the chosen design approach and theory. We will join efforts and work closely together with the *Game Experience Lab* (IJsselsteijn, 2011) from our university; an interdisciplinary group of scholars working together to better understand the captivating player experiences associated with digital games. Their expertise in the conceptualization and measurement of player experiences, gaming for special or unexpected user

groups, and social phenomena around digital gaming will add value to our research.

As de Kort & IJsselsteijn (2008) have argued, digital play needs to be understood within its socio-physical context. Several experiments (e.g., Gajadhar et al., 2009) have supported their model, demonstrating the effects of social context on player experience, and showing that player experience is strongly shaped by the social presence of others, within or around the game. The importance of context becomes especially relevant in the case of ambient play, where the traditional physical context (space/place) is transformed into an omnipresent, dynamic, responsive and reconfigurable space for play. In this way, ambient play challenges the traditional notion of 'game', as governed by a well-defined set of rules, impenetrable to our everyday interactions, and bounded in terms of time, space, and participation (i.e. Huizinga's 'magic circle'). Instead, rules are more likely to be socially constructed, and emergent patterns of play much more like the free, unstructured play in traditional playgrounds, yet triggered and enabled by the artifacts of the ambient play space. It also redefines the role of the players themselves, as everyone present in the ambient play space – players, onlookers, passers-by – may potentially become part of the play activity, dynamically, and even unintentionally or unknowingly, moving in and out of the ambient play space and affecting the unfolding of the play activity. Playful interactions in ambient play spaces are likely to lead to heightened social involvement, as compared with traditional, bounded play environments.

4.3 Partners in Education

An important task of the Playful Interaction chair is also to advance the collaboration between Fontys University of Applied Sciences (ICT) and the Department of Industrial Design. Although there is a difference in approach in what is called applied and fundamental research, it is of the greatest importance that institutes of (higher) education join forces and work more closely together in the Eindhoven region. This should also include the Design Academy. We have established a strong cooperation with the School of ICT at Fontys University of Applied Sciences. The Serious Game Design research group ('lectoraat') is a main partner in research projects and educational activities.

Example 8. Games for Health. In the last year we organized a number of challenging events that mirror this new collaboration, such as the organization of the first European Conference on *Games for Health Europe* (www.gamesforhealtheurope.org) and the Games [4Health] Jam 2011 which was

held here in Eindhoven in October. Around 70 students from the Netherlands and abroad joined for a weekend of game design targeted towards healthcare applications (monitoring, assisted living, participatory health etc). *Sumo Salad*, an innovative game that combines tradition game elements with new action, won the Games [4Health] Jam 2011. For some more examples, see Fig. 31, 32.

Fontys and the TU/e 'share' 4 PhD candidates and one senior researcher. In this way our combined group covers the complete spectrum from playful interaction through play and game design. Moreover in the last two years we have set up a number of research projects in which we work together. This has been acknowledged as a working model by other universities and other institutes of higher education.
Challenging issues here of course are how we can work more closely together in the different Bachelor's degrees. More students who graduate from Fontys should be able to continue their studies at TU/e. Next to that, it would be beneficial to the region if collaboration around central themes could be improved between the different higher education institutes in the Eindhoven region.

Also at the MA level, universities around the world are increasingly offering programs that either specialize in game studies and play or offer other study possibilities in that direction. Some of these programs overlap, while there are also great differences in the chosen (inter-) disciplinary approaches and the length of programs. Although we are seeing a proliferation of such programs – which indicates a growing demand for teaching about games and play – an international structure for exchanging best practices does not yet exist, let alone that there is an international structural collaboration between MA programs. We will try to come to a tentative overview of what there is 'on offer' in MA teaching about play & games, as well as identifying the bottlenecks and needs to improve this field of teaching. We will organize several seminars together with Utrecht University, to share the insights with our partners and eventually set up a curriculum for an international *Master in Play*.

Ladies and Gentlemen, I am reaching the end of my lecture. The ambition of the chair for Playful Interaction can be summarized as follows: to acquire knowledge about designing for playful interaction, and to develop playful innovations for a diverse group of users, such as children and older adults, within diverse contexts, and to relate our research to societal issues, such as the increasing levels of obesity and social isolation. In our opinion, play can contribute to people's sense of social and physical well-being. To accomplish this we are taking a

multidisciplinary approach and developing design guidelines for future intelligent systems, products and services. These systems provide the user with emerging patterns of (open-ended) interaction opportunities that adapt to the behavior of the users over time. In our process, we will involve a wide variety of stakeholders such as companies, non-profit organizations and knowledge institutes. And with these words I would like to complete this lecture with expressing my thanks to colleagues, friends and family.

5 Dankwoord

Allereerst wil ik het College van Bestuur van de TU/e, het College van Bestuur van Fontys Hogescholen en het bestuur van de faculteit Industrial Design bedanken voor het in mij gestelde vertrouwen.

Het Centrum voor Wiskunde en Informatica was de eerste internationaal gerenommeerde onderzoeksomgeving waar ik mijn wetenschappelijke carrière vorm kon geven. Toch is veel van mijn expertise en ervaring op het gebied van design research, gevormd door mijn werk als beeldend kunstenaar. Dus daar wil ik beginnen. Ton Zwerver voor zijn altijd inspirerende en net even andere kijk op de wereld. Waar ik het ook over heb, hij weet altijd de essentie eruit te halen en vond het dan ook helemaal niet vreemd dat ik wiskunde ging studeren. Mike Keane, mijn promotor die mij zoveel vrijheid gaf. Eric Pauwels en Albert Salah waarmee ik de meest spannende en uitdagende problemen aansneed, zonder te weten of we ze ooit zouden oplossen.

Ad Vissers, directeur van Fontys Hogescholen ICT, om de vertrouwensrelatie die we hebben, waarbij kwaliteit voorop staat en het respect voor elkaars zienswijzen. Het lectoraat Serious Game Design waaraan ik leiding geef als lector is in korte tijd een bloeiende omgeving geworden. De samenwerking met de faculteit Industrial Design is uitstekend en doet ons vooruit kijken naar de toekomst van het hoger onderwijs in Nederland.

De organisatoren van het STRP festival wil ik graag bedanken voor de gelegenheid om deze rede uit te spreken binnen de tentoonstelling *50 jaar Nederlandse Media Kunst*. Een mooi voorbeeld voor hoe de universiteit haar betrokkenheid met de samenleving toont.

De faculteit Industrial Design vormt een nieuwe uitdaging. Ik wil prof. Jeu Schouten, prof. Aarnout Brombacher en prof. Berry Eggen nogmaals bedanken voor het vertrouwen dat ze in mij gesteld hebben en voor alle inspanningen die ze zich getroost hebben om mij hier nu als hoogleraar mijn intreerede te laten uitspreken. Ik beschouw het als een eer mede vorm te geven aan deze faculteit met zijn sterke visie over de rol van industrieel ontwerp in onze maatschappij en zijn vooruit-

strevende didactische methodiek. Daarnaast natuurlijk de naaste medewerkers (Janienke, Menno, Rob) maar met naam en toenaam, wil ik Tilde Bekker noemen. Wat geniet ik ervan om plannen te maken en onderzoek & onderwijs vorm te geven.

Pappa en mamma wat waren jullie trots geweest. Toen ik besloot naar de kunst-academie te gaan en vooralsnog geen academische carrière te ambiëren dachten jullie dat ik gek geworden was, maar dit pad heeft uiteindelijk geleid tot waar ik nu ben. Mijn zoon David, de assistent professor in games, met wie ik onlangs een eerste wetenschappelijke publicatie heb voltooid. Marga, Barbara om hun altijd aanwezige stimulans om te blijven wie ik ben. Cyril, Katja, Marieke, het genot om gesteund te worden en natuurlijk Elena; het is ontzettend mooi om met jou verder te dromen. Tot slot wil ik u, hier allen aanwezig, bedanken voor uw komst en voor uw aandacht.

Ik heb gezegd.

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Curriculum Vitae

Prof. Ben Schouten was appointed professor of Design of Intelligent Systems of Playful Interactions in the department of Industrial Design at Eindhoven University of Technology (TU/e) on January 1, 2010.

Ben Schouten graduated from the Rietveld Art Academy in 1983 and works as a professional artist. He found himself interested in patterns and iconography, and discovered his fascination for mathematics. In August 1995 he received a Master's degree in mathematics, specializing in chaos theory. In 1996 Ben Schouten founded Desk.nl, an Application Software Provider (ASP), providing innovative internet related solutions. Together with the Dutch Design Institute (Vormgevings Instituut), Desk was internationally acknowledged with a webby award in gaming. In 2001 he received his PhD for his thesis on content based image retrieval and interfaces that allow browsing & searching for images in an intuitive way. His thesis was acknowledged with a Bronze World Medal for Design in the New Media category, sub-category Information and Education, in New York, USA.

In the following years he started a group in computer vision and human perception at the Centre for Mathematics and Computer Science (CWI, Amsterdam) as well as teaching at the Utrecht School of Art & Technology (HKU) in interaction design.

In 2008 he was appointed Associate Professor of Serious Game Design at Fontys University of Applied Science. His group focuses on multimodal interaction and ambient game design. He has published more then 50 papers in human perception in smart environments and user centered design. He is an advisor for the European Commission on the 'Internet of Things' as well as for the Dutch Cultural Media Fund, responsible for E-culture.

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