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Dr Marnix van Gisbergen

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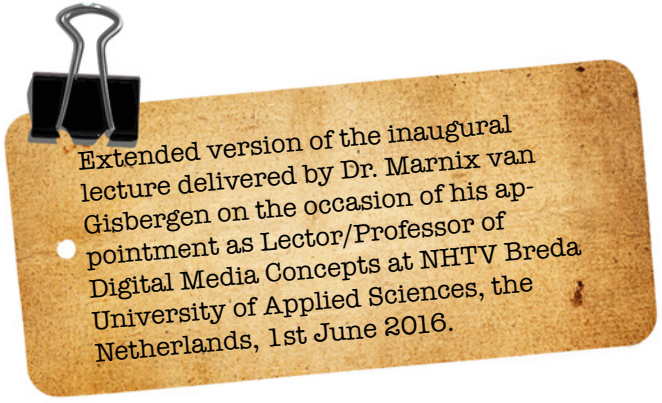

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How rearranging a media puzzle,
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June 1st, 2016
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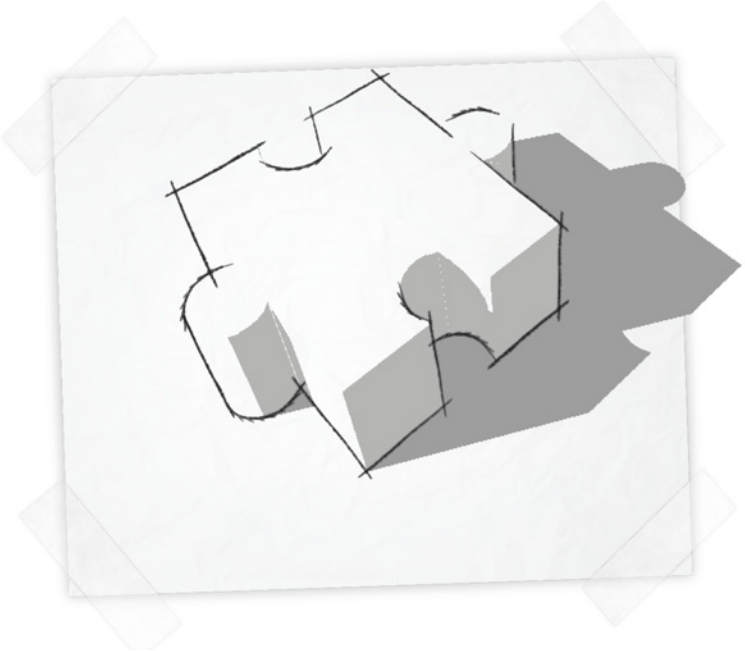
ISBN 978-90-819011-8-5

Design: Susan Burgers & Martin Raven
Print: Notten Grafische Oplossingen



Picture Puzzle Piece

by Shel Silverstein

One picture puzzle piece
Lyin' on the sidewalk,
One picture puzzle piece
Soakin' in the rain.
It might be a button of blue
On the coat of the woman
Who lived in a shoe.
It might be a magical bean,
Or a fold in the red
Velvet robe of a queen.
It might be the one little bite
Of the apple her stepmother
Gave to Snow White.
It might be the veil of a bride
Or a bottle with some evil genie inside.
It might be a small tuft of hair
On the big bouncy belly
Of Bobo the Bear.
It might be a bit of the cloak
Of the Witch of the West
As she melted to smoke.
It might be a shadowy trace
Of a tear that runs down an angel's face.
Nothing has more possibilities
Than one old wet picture puzzle piece.

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INTRODUCTION

The tremendous increase of new digital media developments has not only brought new opportunities for organizations to connect with existing and new audiences, but has also turned the media landscape into a complex and difficult to control media ecosystem. As media budgets do not increase with the same speed as the rise of complementary media, the right choice concerning the role and selection of media has become more important as well as more difficult. Dear members of the Executive Board, Dean of the Academy for Digital Entertainment, colleagues and partners of NHTV, and dear friends and family. To understand these media challenges I would like you to visualize the media landscape as a big jigsaw puzzle.

Changing shapes while playing along

Would you be able to solve the puzzle? Do you believe that the pieces can be put together? Looking back we might consider the 'old' media puzzle as an easy one to assemble. A few large puzzle pieces such as print, radio, television, cinema and games, seemed to connect rather nicely. However, since the dawning of digitalization, it has become a complex and even strange puzzle. While trying to complete the puzzle, a few pieces have disappeared, while many new pieces are thrown into the mix. Pieces that bring to mind new digital media such as smartphones and wearables. This happens at such a high speed that it becomes unclear how many pieces the puzzle box contains. Now, if you were to constantly add new pieces to a puzzle while children were playing with it, they would probably become pretty upset and ask you to stop. But we cannot stop. In fact, we are tending to make it worse, as the new puzzle pieces that need to be taken into account are fluid. Changing shapes while playing along. In addition, these new pieces often seem to alter the existing pieces and in such a way that even they no longer seem to fit with others. Tabs and blanks changing size and position. At this stage, most children would probably start crying, stop playing and run away. This behaviour leads to more challenges, with the media jigsaw becoming a social activity due to different players holding different pieces. As if this was not complex enough already, we also seem to lack the box that shows the

completed puzzle and which clarifies the rules that need to be taken into account when connecting the pieces. As such, it may have become too difficult to figure out how this puzzle works. We might not even recognize it as a jigsaw puzzle and therefore not even try to put the pieces together.

However, the game goes on. Without having solved the 'old puzzle', an important piece has been added to the jigsaw: virtual reality. Although virtual reality has in fact been a piece of the puzzle for a considerable time, it has only recently become large enough to be noticed by many players. A small piece might not be missed in a puzzle that consists of a large number of equal pieces. However, when the puzzle consists of unequal pieces and the virtual reality piece is rather large, it is almost impossible to disregard it. To leave the virtual reality piece out, would probably not only leave the puzzle incomplete but also cause concern due to an ugly visible gap. At the same time, although the virtual reality piece is still fluid, it seems to be evolving into an important corner piece that makes it easier to complete the puzzle. This would imply that when looking for a possible strategy, it might be a good idea to include virtual reality as one of the starting pieces. While at present it is unclear whether virtual reality will change the place of existing pieces, such as game and film, some players have already taken the approach that it is 'better to be safe than sorry'. Afraid that the puzzle will fall apart, they have started applying 'puzzle preserver' before the virtual reality piece has been added. However, we may have to rearrange the media jigsaw due to virtual reality. A challenge that we are happy to take on within this professorship, as reorganizing the pieces often leads to new digital media concepts. The apt combination of (future) media managers and game developers within the Academy for Digital Entertainment should be able to crack this evolving challenge as well as keep it entertaining.

So, although it is certainly interesting to examine the effects and potential of virtual reality as a medium on its own, the truth is that virtual reality will act within the existing media puzzle. Media of which some fulfil to certain extent the same roles, at least to a certain extent, or respond to the same consumer needs and have been developed on the basis of existing media schemata (previous media experiences and expectations). This media context will shape the role and functionality of virtual reality as a medium, and, in turn, virtual reality will change the role of existing media. Therefore, the first goal within this professorship is to better understand the role of virtual reality in the media context, as well as how this context will influence our perception of virtual reality (Goal 1). In doing so, we will examine how the context can be used to frame and define roles for virtual reality as a medium. As such, we also believe in the added value of examining the functionality and effects of virtual reality while taking into account the media that surround virtual reality (Goal 2). In addition, we want to go one step further and explore how we can use this context to connect virtual reality with other media (Goal 3). This also means that we hope to optimize the connection between virtual reality and audiences who do or do not move across different media platforms, and as such help organizations realize an efficient virtual reality strategy based on media context connectivity.

Before discussing these three goals, I will first recount the important developments in virtual reality both within and beyond NHTV. In doing so, I will illustrate how the idea's and the research behind these developments can be used to understand and predict the role of virtual reality in changing the media landscape of today.

Daughter Luna 8 years old, explaining how the Oculus works

A CONTEXT OF VIRTUAL REALITY HISTORY

Once the technology is invented, it will be very hard to 'uninvent it' and not use it (McLuhan, 1964). One reason for the increasing interest in Virtual Reality (VR) seems obvious: the rapid increase in newly available VR technologies that seem to fulfil audience needs. Developments that seem to suggest that VR will be adopted as a medium and eventually used by a large audience. However, VR is not new. I will briefly discuss important VR developments. While this is by no means exhaustive, the intention is to gain a better understanding of how these developments have generated ideas and predictions about the role of VR within the media puzzle and, in turn, how these have helped create and shape the VR devices of today and will continue to do so in the future.

A context dependent definition of VR

Unreal virtual realities of the past seem to have become real virtual realities of today. As a child I frequently created virtual worlds without media, often using a combination of toys, drawings, people and fantasy. Or I created virtual realities using traditional media such as comics, books, cinema, games, animations and of course television. So where should we start when providing an overview of VR developments? Answering that question is almost as difficult as trying to explain the difference between VR, TV, a movie and a game. Intuitively, we expect, accept and assume differences that are commonly shared and can easily be described. However it is fact very challenging to describe the difference between VR media and other media and it might even be a matter of perception and subjective boundaries.

Although, for the sake of simplicity, we focus on and use the term 'virtual reality', within this professorship we will study and compare different media within the reality-virtual continuum, as described by Milgram and Kishino in 1994. 'Real reality' and 'virtual reality' lie at the opposite ends of this continuum. 'Real reality' is described as the direct observation in person of 'real objects', while VR is understood as an environment consisting of a mediated observation of solely virtual (digital) objects, that do or do not reflect 'real reality'. In between, there are Mixed Realities (MR) in which real world and virtual world objects are combined. Different terms are used to designate the space within the MR boundaries, such as Augmented Reality, Augmented Virtuality, Trans-Realities and Altered Reality, based on the ratio between real and virtual objects and the reality-fiction proportion of the virtual objects. New developments in relation to holographic displays, in which all four mechanisms of sight are stimulated (binocular disparity, motion parallax, accommodation and convergence), will also be taken into account. In line with the continuum framework, Steur (1992) argued that in order to examine VR in relation to other media it would be better to define VR as a particular type of experience. As a mediated perception of being present and immersed in an environment, rather than as a collection of hardware that will never be complete. One could even argue that to understand VR you need to experience it. Several clips circulating on YouTube of people who fall over or scream in fear while using a VR

To understand VR you need to experience it

Figure 1: Virtuality Continuum (Milgram & Kishino, 1994

device, seem to support this statement. However, creating an overview of important VR developments almost immediately pushes you into a position of defining VR as a particular collection of technological hardware. VR is indeed often defined as a medium relying on a combination of technological systems (Steur, 1992). Although these definitions often differ, they frequently include a combination of similar types of technologies that are expected to increase a sense of realism or presence and enhance an experience (Clemente et al., 2013; McLuhan, 1964; Sanchez-Vives, & Slater, 2005; Welch et al., 1996). The combination consists out of the following four dimensions: a (I) a sensory, (II) an interaction, (III) a control and (IV) a location dimension (Figure 2).

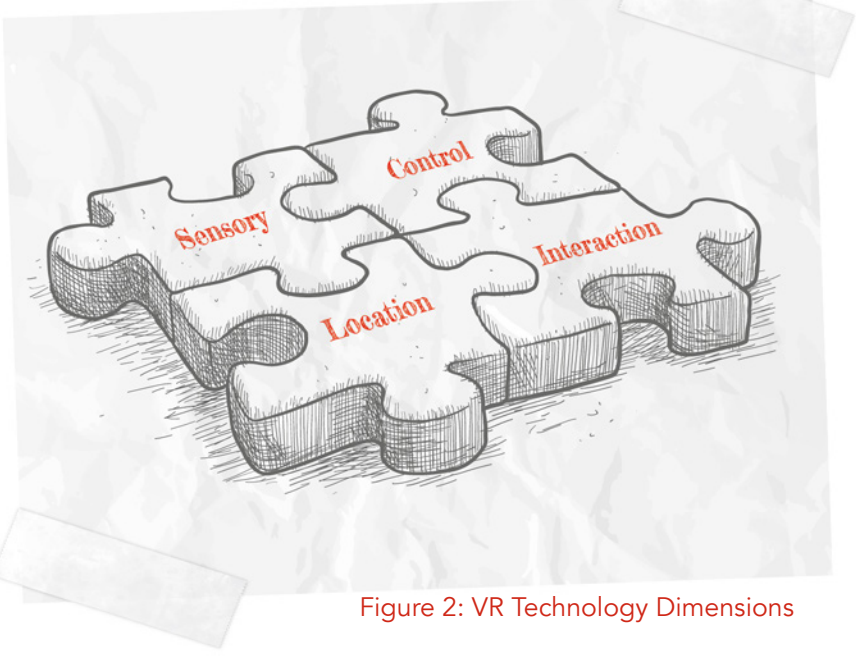


Figure 2: VR Technology Dimensions

The sensory dimension relates to technologies used to access content. It is often stated that a mediated experience will feel more real if more senses are engaged (Mcluhan, 1964; IJsselstein, 2003). Recent developments within VR are often related to visual sensory technologies, used to optimize, for example, the field of view, perspective, resolution, intensity and degree of depth of the digital image. However, within this dimension, innovative sound and touch technologies designed to access and allow an enhanced experience of a virtual world have also become more important (using devices that range from pressure pads in body suits to force-feedback arms). The interaction dimension refers to technologies used to explore, navigate through and participate in virtual environments and they range from simple keyboard input technologies to more advanced headset, goggles and glove technologies. The control dimension refers to technologies that provide users with the possibility to regulate real-time interaction with the virtual environment and in doing so give them, for example, the freedom to look around and decide for themselves what, when, where and how often to look at something. In addition this dimension encompasses technologies that make it possible to manipulate and change the virtual worlds. More recently they also include technologies that make it possible to share content and socially interact with others within a virtual environment. Finally the location dimension refers to technologies that are used to automatically locate and track the user in the physical and virtual world. These include frequently used technologies in smartphones and wearable's, including GPS and inertial sensors such as a compass, accelerometers and gyroscopes, as well as more sophisticated eye and full-body motion trackers. Thus, VR is defined through a unique combination of technologies and or performance. However, this technology driven definition of a VR medium seems a matter of contingency and is often based on comparisons with existing media. For example, a new device is considered a VR medium because it has a wider display angle and more location possibilities compared to television, or because it has more interaction possibilities compared to cinema but the same, or even fewer compared to games.

The role and shape of VR will be influenced by the surrounding media

The technological approach as well as the conceptual and effect-driven (experience) approach imply that the role and shape of VR will be influenced by the surrounding media. Defining VR as a medium that creates 'an experience' or as a medium with a particular combination of technologies does not make a lot of sense, as all media create an experience and possess these

technologies to a certain extent. Therefore, by themselves they are not sufficient to distinguish VR media from traditional media. However, the technological as well as the conceptual approach can be used to classify VR in relation to other media. VR can be positioned as a different medium due to its ability to create a more 'realistic' experience compared to other media based on a 'unique' combination of new technologies. Precisely what is considered a VR medium will always remain subjective, although the VR classification boundaries seem to have become stricter due to improved technologies.

A VR starting point

From a technological viewpoint, one could argue that the history of VR started in 1836 with the creation of (the illusion of) three-dimensional depth using stereoscopic images. Slightly different images presented to the left and right eyes provides the brain with the perception of 3D depth. Stereoscopy soon led to the development of stereoscopic viewers, such as the famous View-Master (introduced in 1939), and the use of stereoscopic imaging techniques in cinema (early 1900s) and television (1928), eventually leading to recent digital developments in (3D viewers used for) 3-D Cinema and 3-D TV (IJsselsteijn, de Ridder & Vliegen, 2000). Today, stereoscopic print images have been replaced by smartphone images in some contemporary popular VR devices, such as Google Cardboard. However, the underlying stereoscopic technologies work on the same principles and as such are unchanged from earlier stereoscopes, as demonstrated in Google patents (Gilchrist, 1997). Although stereoscopy is different from displaying in full 3D, which incorporates the observers head and eye movements, previous studies that focus on differences and similarities between stereoscopic versus non-stereoscopic media can be used to predict and explain the role of VR. In addition to stereoscopic and widescreen movie developments, multisensory technologies were introduced to movie theatres as early as in the 1950s and 1960s, ranging from the addition of aromas to vibrating devices attached to theatre seats. Hence, many of the technologies and principles behind contemporary VR media were developed and studied by means of immersive and multisensory formats that have been explored since the late nineteenth and early twentieth centuries. A famous example is the Sensorama created by Heilig in 1962. The Sensorama was based on ideas Heilig had written down in 1955 in his paper "El cine del Futuro" (The Cinema of the Future), published in an architectural magazine, and re-published in 1992 in the journal Presence. The idea behind Sensorama was to create a multi-sensory theatre (Heilig, 1992). This resulted in a device that was able to create stereo sound and wide-angle view stereoscopic 3-D images, while at the same time exciting more senses by body tilting, and the addition of wind and aromas during the film. Since the introduction of new VR technologies some are 'believers' looking for possibilities to use VR in films, wanting to utilize the expected advantages of an enhanced experience. There are, however, also 'challengers' who defend 'traditional media' such as cinema. This discussion relies for a large part on the idea that the success of VR adoption is media context dependent. Expecting VR to either replace or be replaced by existing media, depending on which medium will communicate the 'same content' or story most effectively.

A VR head-mounted display

Although VR has its origins in many different technologies and ideas, as early as the 1950s VR devices were being created that made use of head-mounted displays (for an overview see Earnshaw, 2014; McLellan, 1996). A head-mounted display (HMD), presents a virtual reality by means of a (stereoscopic or 3D) display optic near the eye(s), using a helmet or strap around the head. A device (outside or within the VR device) calculates and renders the appropriate visual and auditory perspective based on the head and body movements of the user. One of the first HMD virtual reality devices, using stereoscopic and mechanical head tracking system, was created by Sutherland and Sproull in 1968. However, it was so heavy it needed to be perilously connected to the ceiling above the user's head and therefore was termed 'The Sword of Damocles'. In the 1970s and 1980s many more virtual and augmented reality devices and applications were created, mainly in military and space (NASA) projects working on flight simulators. Important examples that have influenced VR technology today, using technologies such as wide field-of-view, stereo, head-tracked and head-mounted displays at relatively low-costs, are the VIVID (Virtual Visual Environment Display) and the VIEW (Virtual Interactive Environment Workstation) devices, created by NASA in the 1980s. Other important

developments deal with VR-related hypermedia, such as the 'Aspen Movie Map' created at the end of the 1970s at the MIT Machine Architecture group (later to become the MIT Media Lab) that allowed the user to take a virtual tour through Aspen, making it a sort of 25 year precursor to Google Earth. Further important projects developed in the 190s relate to the way we interact in virtual worlds such as the Data Glove (by Lanier) and arcade VR machines such as the 'Virtuality' as well as less successful HMD initiatives for consumers from companies such as SEGA and Nintendo ('The Virtual Boy') or the 'VFX1' by Forte Technologies (Maria et al., 2011).

In relation to these developments, we will briefly focus on two important moments which gave a boost to the adaptation of VR technologies and which are connected to the development of VR research within NHTV and the Academy for Digital Entertainment (ADE). These concerns the development and use of 'Cave Automatic Virtual Environments' and the consumer-targeted VR headset, the Oculus Rift.

ADE in context: a CAVE

During the 1990s, it became very popular to use a 'Cave Automatic Virtual Environment' (CAVE) to create and experience VR worlds, particularly within knowledge institutes. The recursive acronym CAVE is a reference to the 'Allegory of the Cave' recounted by the Greek philosopher Plato, who argued that people infer reality in the way that prisoners chained facing the wall of a cave could only see projections of shadows cast on the wall by object moving in front of a fire behind them (IJsselsteijn, de Ridder & Vliegen, 2000). A CAVE is a room-sized projection-based surround VR system, often using rear-projection screens connected to a motion capture system that records the real-time position of the user (Cruz-Neira, Sandin & DeFanti, 1993). Many CAVE variants have been built and used since the first prototype was showcased in 1991 (DeFanti et al., 2009). On the initiative of my predecessor Hans Bouwknegt, former ADE dean, Frank Peters and former ADE researcher Koos Nuijten, ADE acquired a second-generation CAVE as part of the Medialab in 2009. New generation CAVEs are already on the market with many improvements related to brightness, visual acuity (contrast and resolution), immersive audio, stereoscopic and 3D projection and movement and tracking possibilities (for an overview see DeFanti et al., 2009).

CAVE usage, however, will be affected by new emerging VR technologies. This context of new VR devices creates a new question as to whether we need to further develop CAVE technologies, and if so, how. We will look for an answer using three context dimensions, as well as a cost-benefit dimension. The first dimension is technology driven: comparing differences between important technologies that influence experience such as resolution, image quality and field of view. The second dimension is the user context, mainly driven by differences in possibilities concerning the number of users and observers of the VR experience and the accuracy of 'presence' of these persons within the virtual world. CAVE supporters often refer to the importance of seeing a real person, including yourself, in a VR environment (situated in the same physical location), instead of a virtual representation of some kind as in HMDs (Buxton, B., & Fitzmaurice, G. W., 1998). The third dimension, ease of use, relates to the disposal of materials that create a sense of isolation (e.g., helmets), restrict movement (e.g., cables) and are uncomfortable to the body and eyes, and thus hinder a pleasant VR experience. In addition, this dimension relates to possibilities of interacting in VR using real technologies. The fact that a real smartphone could be used in a virtual world, to measure for example Location Based Advertising (LBA) effects, was an important factor for us in choosing a CAVE setting (Hühn et al., 2012; Ketelaar et al., 2015).

All these dimensions are related to the key question of whether or not different VR technologies create different experiences. Measuring differences and similarities between VR technologies as well as between VR and other media has become more relevant with the release of affordable and technologically advanced VR HMDs such as the Oculus Rift.

ADE in context: the Oculus Rift

The story goes, in June 2011, 18-year-old Palmer Luckey designed a rough prototype of an HMD VR device in his parents'

garage that would serve as the basis for the company Oculus VR, founded in 2012. The company would be purchased by Facebook for $2 billion in March 2014. Before this purchase, in the summer of 2012, Oculus VR initiated a Kickstarter crowdfunding campaign that collected over $10 million. During this campaign it was possible to obtain an Oculus HMD VR prototype (DK 1), by contributing $300 or more. Seeing the potential to suddenly be able to reach a lot of people at home with VR, instead of inviting a few people over to experience VR in a CAVE setting, we decided to order several Oculus Rift development kits. Starting in 2013, we transferred virtual worlds created in the CAVE to the Oculus Rift, with staff, students and companies collaborating in research that included developing, measuring and comparing virtual reality experiences in CAVE and HMD settings. In addition, students and staff started to develop VR game and media-related content that among others resulted in ADE (Creative Lab) releasing one of the first VR movies on the Oculus Rift (DK1) in 2014. During this period, many discussions took place within ADE about the potential of the Oculus Rift, and whether or not VR would soon gain ground among a broad user group. Sceptics referred to the unfulfilled VR promises of the past and the many challenges that still faced VR. They primarily argued about technical and motion sickness (latency) issues, inferior visual quality and lower reach compared to other media such as games and movies (the Oculus Rift DK1 was not available to consumers). In July 2014, however, a second development kit was released (the DK2), with a better display and higher refresh rates and resolution (960×1080 instead of 640×800 per eye). The DK2 also included infrared positional tracking, which decreased the feeling of nausea and made it possible to detect movements such as leaning, and many improvements to 'ease of use' (fewer cables and external control boxes).

In 2015 ADE was one of the over 100,000 companies that possessed a DK2 and published the first ADE student and staff 'DK2 VR' experiments and concepts. The first Oculus VR consumer version, released only a few weeks ago (28 March), revealed yet again many improvements related to vision (e.g. two screens instead of one, a higher 1080 × 1200 resolution and refresh rate of 90 Hz and lower persistence), tracking (e.g. extended to 360 degrees), audio (e.g. built-in 3D interactive sound), extended usage capacity and adjustments to different users (e.g. less weight, better ergonomics, improved aesthetics and the added possibility to adjust settings to different facial and eye shapes and the wearing of glasses) and new interaction possibilities such as the development of new controls (Lamkin, 2015). Needless to say, Oculus has also already revealed that they are planning to release a better VR device 'soon'.

A VR adoption dimension model

Over the past five years, VR has developed at such a high pace that it seems that in 2016 the 'early adoption stage' has been reached, as described in diffusion process models such as 'the technology adoption lifecycle model' (Rogers, 2003). While a few years ago new and affordable VR HMDs were only available for professionals and developers, they recently have become available to consumers as well. These VR headsets differ in technological performance, ranging from relatively low-end affordable devices that make use of your smartphone (which acts as the headsets display and processor), such as the (fold-out) Google Cardboard (released in June 2015) to the more advanced VR GEAR, released by Samsung in collaboration with Oculus in November 2015, in which the unit acts as a controller and, compared to for instance VR Cardboards, makes more advanced rotational tracking and proximity awareness features possible (e.g. to detect when the headset is on). As of 2016, consumers also have access to high-end VR HMDs that rely on powerful computers and game consoles, such as the Oculus Rift (March 2016), the HTC VIVE in partnership with Valve (April 2016) and the Sony PlayStation VR (to be released in October 2016). They are all aiming for large market share and it is expected that many consumers will use these VR devices over the coming years, leading to billions in VR revenues within the next three years (Digi-Capital, 2016; SuperData, 2016). In addition, many VR HMDs variants will be released, each focussing on a unique benefit that distinguishes them from the others: for examples the VR headsets such as the Glyph (aims to increase user comfort), the Zeiss VR One (aimed to fit different types of smartphones) and the Fove (using eye-tacking to increase display performance). Companies such as Google and Apple also appear to be working on stand-alone VR headsets that do not need to be connected to a computer or mobile device (King, 2016). Furthermore, several devices are

and will be developed to increase the VR experience by means of movement, touch and (eye) interaction possibilities (Metz, 2016). Alongside these developments, new Mixed Reality devices are being developed such as Microsoft HoloLens: a headset that creates Augmented Realities by means of holograms (Development Edition released in March 2016 for $3,000). These developments create a context that resembles 'the videotape format war' during the 1970s when the Video Cassette Recorder (VCR) was released (Van Gisbergen, 2016). While some brands positioned themselves as having the best technology (Sony/Betamax) with a focus on video sales, other brands focused on the rental market and used a low-priced positioning strategy offering the most content (e.g., VHS/JVC) or newest innovations such as Philips/Video 2000 (Wikipedia, n.d.). Although we do not know whether current VR technologies will be replaced by new technologies as happened with VCR (the last dedicated

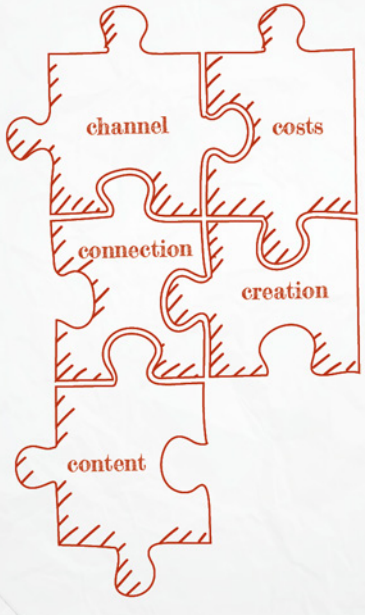


Figure 3: VR Adoption Dimensions

JVC/VHS unit was produced in 2008), the videotape format war has made us realize that it is important to look at more dimensions other than technology. We argue that VR will enter the 'early adoption phase' due to an increase in developments within all five adoption related dimension: (a) Channel (technology), (b) Creation (production), (c) Content (availability), (d) Costs and (e) Connection (sharing and communication) (Figure 3).

We have already discussed technological developments within the Channel and Cost dimensions. Also of importance to reach the adoption stage is the Creation dimension: the possibility to easily create and produce VR content in a professional and user generated context. Important developments in this respect include apps and camera's that make the creation of recorded VR experiences possible by means of 360-degree video and photos. Examples include the Jaunt One and EYE camera available to the professional market as off 2016, with costs ranging between $10,000 and $140,000 (for an overview see Klive, 2015) and the Samsung GEAR 360 that will be released for the consumer market in 2016, probably for under $400 (Nafarette, 2016). In addition important software that helps to create animated VR content has also become available. Companies behind the popular VR HMDs recently released several software development kits and open (Android and iOS) platforms connected to widely available software and game engines. This makes it easy to develop, distribute and sell VR content. The creation dimension also encompasses a growing number of companies and VR professionals who create content. One such company connected to a VR manufacturer is the Oculus Story Studio (launched in 2015), which includes former employees of major 'traditional game, animation and film media companies', such as PIXAR and Industrial Light and Magic (Zeitchik, 2016). In addition, traditional media companies started working on VR content, such as the former Dutch game company, Vanguard Games which through a recent merger (April 2016) has become a content and technology development studio exclusively for VR (Force Field, 2016). Related to the creation dimension is the availability of the content itself. In recent years thre has been a tremendous increase in VR content and the number of third-party apps available, which will be crucial for successful

VR adoption (Terdiman, 2016). When Samsung for instance launched the Gear VR device, more than 100 apps were already available. Meanwhile, Sony revealed that 50 VR games will be released, some exclusively for the PlayStation VR, before the end of this year (Kane, 2016). Oculus has also launched several VR games created in collaboration with large gaming companies, as well as second-party high production value games. As Oculus executive Rubin explains "the more content that is created, the better the VR industry does" (in Gaudiosie, 2016). The increase in VR content is not only visible within the creative sector but in many of the top sectors ranging from Life sciences & Health to Energy and Logistics (see Sheikh, 2016). The fifth dimension, Connection, is related to increased possibilities to find, share and stream (live or otherwise) content, as well as to transform the VR experience from an individual and isolated experience to a social experience. Important examples of developments in relation to finding, sharing, and or streaming VR experiences include new channels such as the 360° YouTube channel (March 2015), pre-modelled 3D environments that allow you to experience content such as found in Netflix using Gear VR and easy access menus such as Oculus Home. The moment Facebook acquired Oculus they claimed VR as the social platform of the future (Metz, 2016). Indeed, there are many examples for social VR experiences and games that are under development or that have recently be released. Of course, there are those by Oculus itself, such as Oculus Cinema and Oculus Social Trivia, in which multiple users can watch the same VR movie or interact with one another through avatars in the same virtual space. However, there are many other examples of games, such as Ubisofts first multiplayer VR game, 'Werewolves Within' (to be released in 2016) and social VR platforms initiatives such as project Sansar (Second Life), VRChat, vTime, AltspaceVR and Convrge (Smith, 2016). All of these developments have already led to a complex VR ecosystem with many players (see CBInsights, 2016; EUVR, 2015; GreenlightVR, 2016). Table 1 provides an incomplete overview of announcements within the five VR adoption dimensions, up to two months before this lecture was published. Revealing that print is no longer suitable to provide up-to-date overviews, as well as that VR is here to stay as a medium that involves many people. Commending further research towards its role within the media landscape.

> "The more content that is created, the better the VR industry does"
>
> *Oculus executive Rubin*

Channel	Creation	Content	Costs	Connection
09	First VR cinema in Amsterdam	Amazon Video is building a VR platform	EA postpones high-end AAA VR games	HTC Vive: $799 includes Bluetooth	Create VR friend rooms for Twitch & Vimeo
10	VR Radeon Pro Duo graphics card released	Samsung Gear 360 Camera ships in Q2	Sony working on 50 VR game titles for 2016	Google is selling VR headsets directly	2 multiplayer games released for Gear VR
11	News: Samsung Entrim 4D motion headphones	SteamVR plug-in for Unity for MR video's	VPRO launches their third VR film (and app)	$3,000 HoloLens dev. kit ships this month	vTime (social network) on Google Cardboard
12	Oculus Rift VR pre-orders are released	Sony claims having 230 VR game developers	Valve releases 38 titles for HTC Vive	Manus VR Glove Dev Kits available for $250	VR live stream Hardwell concert for all VR sets
13	Introduction VR Steam Desktop Overlay	VRLA: $6m for easy VR story creation software	Pornhub opens large VR porn channel	PSVR price release: €399 (bundle: €499)	Hulu on Oculus but lacking social features
14	HTC working on new mobile VR Headset	FOVE raises $11m for Eye-Tracking Headset	Oculus Rift releases over 30 new games	Samsung releases GEAR 360 price: €350	View live streamed cancer surgery in VR
15	Huawei releases VR headset	Disney signs Nokia deal to use OZO VR Camera	Major League Baseball team practices with VR	GoPro releases new VR camera rig for $500	Facebook reveals social VR 'selfies' prototype
16	Samsung working on standalone VR headset	Android N expanded support for VR	Minecraft available on Oculus for Gear VR	1.8M TNYT subscribers: free Google Cardboard	YouTube introduces live 360 video
17	NVIDIA Tool Captures In-Game 360 3D Photos	HTC launches $100m VR start-up programme	NextVR & TIME release VR magazine content	10 VR Games for $3 in IndieGala Bundle	'VR LAN party' software launches for free

Table 1: VR Adoption Dimensions Developments

CONTEXTUAL CONNECTED MEDIA: SHAPING VIRTUAL REALITY

Within the contextual connected media research line we will explore how a media context framework can help us to understand and examine the positioning of VR within the media landscape. Using context as the starting-point, rather than content or creation, we follow the reasoning of McLuhan (1964) who stated that "a new medium is never an addition to an old one, nor does it leave the old one in peace. It never ceases to oppress the older media until it finds new shapes and positions for them" (p.174). We will start by explaining how our concepts relating to the old media are unavoidably used to understand and perceive the role of the new medium VR. On the basis of the outcomes, we look deeper into the consequences with respect to measuring and exploring VR roles and, finally, will elaborate on strategies that can connect VR with existing media.

"A new medium is never an addition to an old one, nor does it leave the old one in peace. It never ceases to oppress the older media until it finds new shapes and positions for them"
McLuhan (1964)

Goal 1: Understanding the role of VR in a media context

The first goal of this professorship is to understand how the media context influences our perceptions of VR and how that has an effect on the positioning of VR within the media landscape. We will discuss how a media context framework must, unavoidably, be used to understand and conceptualize VR roles. Acknowledging the importance of context and the human tendency to group things, we rely on a Gestalt perspective. The central idea behind the Gestalt principle is that "things are affected by where they are and by what surrounds them" (Behrens 1984, p. 49) and as such a perceptual 'whole' is created that differs from the sum of its parts (Graham, 2008). 'Things', 'what' and 'parts' can easily be replaced by media. In taking this perspective we argue that the understanding of new media is based upon prior media knowledge and the combination of media that surround the new medium.

Although we know that we should avoid approaching a new medium in terms of its predecessors, we very often cannot help do otherwise. As new media appear, old media schemata automatically seem to pop-up. As such, we seem to be captured by what McLuhan referred to as the rearview-mirror image of our world: "Because we are benumbed by any new technology, which in turn creates a totally new environment, we tend to make the old environment more visible...attaching ourselves to the objects and atmosphere that characterized it" (in Norden, 1969, p.56). McLuhan (1964) used the metaphor of a horseless carriage to illustrate how we are inclined to perceive new technologies by means of the old. When we do so, it is difficult to understand the nature and potential of a new medium. As McLuhan predicted, it seems that every new medium still needs to pass through a primary phase in which it is conceptualized by means of existing media. Despite the fact that we now understand that television is not a radio with pictures or that a smartphone is not a small computer in the same way that a car is not a carriage without horses, the assumption is that to begin with it is easier and more (cost-) efficient to transfer content from the old to the new media than to create new content that fits the new medium. For example, when the smartphone was introduced, we still made use of existing websites or created new websites in a similar manner as we did for desktop computers. This tendency is also visible in relation to the introduction of VR encouraged by the tendency to tag new VR media by means of the old.

Nomen est omen

Referring to a VR device as a film or game medium, may have a significant role in determining its functionality and role (nomen est omen). VR devices are often developed with a certain purpose related to traditional media roles. Oculus, for example, stated that Rift was primarily a gaming device and consequently the main content that Oculus will release will be focused on games. Naturally, Sony PlayStation VR uses the same strategy and consequently these VR devices are being developed and compared based on their gameplay performance (Winchester,

2016). Describing VR as a game platform automatically creates a context in which VR media are compared to 'traditional' game media, opening the discussion towards whether VR will complement or replace traditional game media. Labelling media immediately triggers expectations, and guides perceptions and in doing so guides development. For example, consider the cartoon image of an Indian that we used in research while I was working at Radboud University Nijmegen (Figure 4).

Figure 4

When participants were asked to describe what the image was trying to communicate, very different interpretations were given or no interpretation at all. However, when we showed the same image within an advertising context, by adding a car brand, two things occurred: an interpretation was given more often and negative interpretations disappeared. Adding a brand creates a persuasive context in which only positive product claims are communicated, which reduces the number of possible interpretations (Ketelaar, & Van Gisbergen, 2006). Moreover, our research demonstrated that different brands stimulate different readings of the image, revealing that the same object can be perceived differently due to context (Jans, Ketelaar, & Van Gisbergen, 2008; Ketelaar, Maesen, Linssen, & Van Gisbergen, 2013). A mechanism that we referred to as brand anchoring (Ketelaar, & Van Gisbergen, 2006). Once the viewer was aware that a car is being advertised, the image guided them towards the message, in this case that the car was fast (the character was run over because he had no time to leave the road) or that the car had a silent engine (the character was run over because he could not hear the car). Based on the brand that accompanied the image, either Porsche connected to fast cars, or Toyota Prius, as a silent car, one of the two interpretations was inferred (Ketelaar, Van Gisbergen, & Beentjes, 2008).

With respect to virtual reality, this means that if we frame the new VR technologies as tools that can be used to create movies, this will immediately trigger schemata that are connected to traditional film media. As a result, we will: (a) try to understand and develop VR as a film medium, (b) try to transport film content to VR and/or (c) try to position VR as being a better (or worse) medium to experience movies. If we attempt to understand and develop VR as an addition to existing media, we might risk VR passing through a phase of being misconceived and misapplied, as happened when media such as print and cinema were first introduced (Mcluhan, 1964). If VR is considered as a complementary film medium, this will mean that content created for other media will be transferred to the VR medium, as we currently do with movies, in which a film takes a journey that will go via cinema to online-movie streaming media and DVD and finally to television. While the content remains relatively the same for all media, only the moment of release (the 'window agreement') and the context of consumption changed (Van Gisbergen & Ketelaar, 2001). The transfer of content from traditional media to VR is already occuring. Examples can be found within both the film and game domains. For example, Oculus has created the free application Oculus Cinema allowing the viewing of conventional movies and videos from inside a virtual cinema environment (a virtual cinema sized screen and room). Netflix can be viewed within virtual worlds as well. No changed is made in the content: it is the same movie or programme that can be viewed in a real theatre or on television. Although it is the same content, it could be argued that this will be experienced differently when different

media are used, or when different virtual environments (contexts) are created. Moreover, equally important is the question of whether the same content should be transferred from traditional to VR media at all. Would it not be better to always create new content? Movies, stories and games are already being adapted to fit within the virtual environment and new content has already been created to make use of specific VR features. Interestingly, this also means that new terms to differentiate between content need to be conceived in order to avoid confusion. Terms such as 'Spherical videos', '360° 3D videos' and 'virtual reality movies' are used to differentiate between content that can be viewed solely using VR devices and content, for example 'movies', that can be viewed using traditional media as well. VR manufacturers and VR content developers and distributers often state that the best experience is created when the content (film or game) is designed especially for VR from the start (Leone, 2016). Indeed, content is created solely for VR, such as a 360° 3D film, previously mentioned, that does not fit traditional media. Sony also recently announced that it is working on creating small 'VR game experiences'. Although Sony does not have large internal teams working VR games as they have for their AAA console games, they do believe that this eventually will happen (Leone, 2016). However, due to the complex and evolving nature of VR as a medium, in the short term VR will not be fully comprehended and as such the content created will rarely be novel and ideal for VR. As former game developer and current head of studios at Oculus VR explains "The very language of VR gaming, film, and entertainment has not yet been formalized" (in Gaudiosie, 2016). Thus, even when we acknowledge that VR is an entirely new medium that needs and demands the creation of new types of content, and even when VR principles are fully understood, our perception of VR will always be influenced by the old media context.

Our perception of VR will always be influenced by the old media context

How context makes us see

Although we tend to measure the effect of a single medium without taking the context into consideration, we seldom interpret media content without consciously or subconsciously being influenced by the surrounding media. How context influences perception is clearly illustrated in an example provided by Bosch (1985), based on an illustration by Olson (1970). The illustration demonstrates that the context, in this case the visual presence of different surrounding objects, influences how we perceive and describe the same object. In the example, the same object is depicted in five different situations (Figure 5). Deprived of

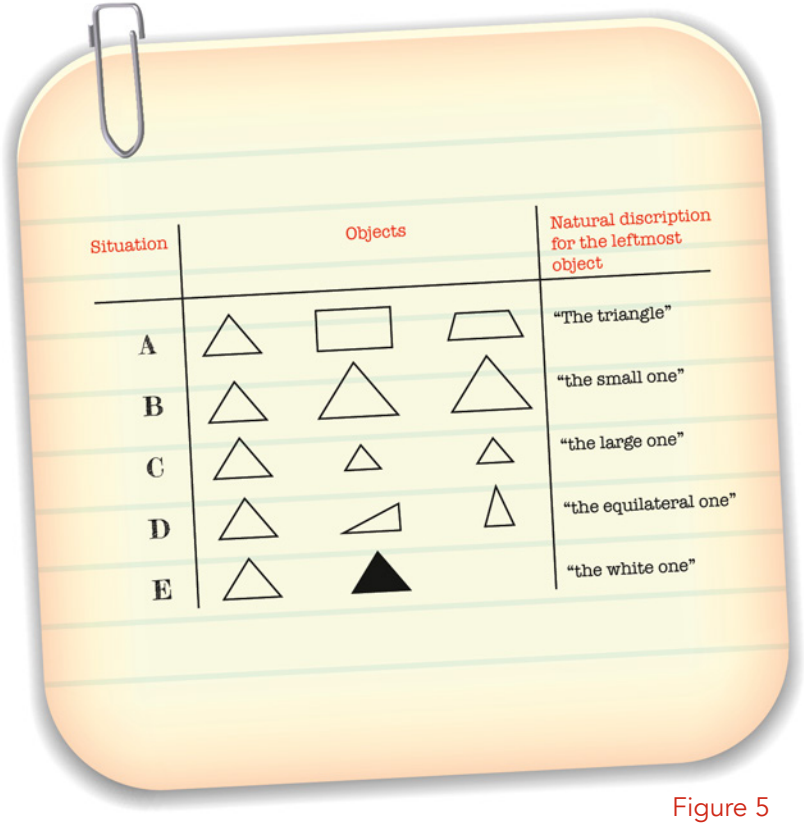


Figure 5

context, the object would consistently be described as a 'triangle' in all five situations. However, within each specific context the perception of the object changes, although the appearance of the object itself (the 'triangle') remains the same. Our perception is influenced by the main attribute that distinguishes the triangle from the accompanying objects, altering the description of 'a triangle' in descriptions such as the 'the small triangle'

or the 'large triangle'. It can even shift the focus to the main actual feature that differentiates the object; for example, describing the object as the 'the white one' rather than the 'white triangle'. Accordingly, we might perceive VR as a game medium when compared to television but at the same time consider it more of an experience medium when compared to traditional film media. This example demonstrates the importance of taking context into account when studying the effect of media. We often consciously or unconsciously select a media context ourselves. Thus, how we perceive and describe VR is dependent on the surrounding media and vice versa. We need to explore the mechanisms behind this process to better comprehend the functionality of VR. As stated by Bosch: "…if we do not take the mechanisms into account that match descriptions and contexts, communication becomes a mystery. If the same description can refer to different things and the same thing can be referred to by different descriptions, then we either have to investigate the mechanisms governing the preferences or admit that communication is only for telepaths…"(1985, p.143). In doing so, an important first step is to understand which context features are considered most relevant. Based on the technology-driven VR definition, 'interaction' and 'control' are the first apparent candidates (Figure 6).

VR is probably considered as the 'interactive one' when situated alongside radio and television. When VR is positioned alongside cinema it is likely that VR will be described as the 'one exerting less control', due to it offering greater story participation and content manipulation opportunities for the audience (although, interestingly, from an audience perspective rather than that of production, VR would be positioned as the 'one offering more control'). Indeed, these dimensions are used to position and discuss the role of VR within the media jigsaw puzzle, especially when it concerns the context of film and game media. In 1955, Heilig described how film critics were already sceptical about new 3-D and other VR-related developments that would provide less control over the narrative and thus could have a negative effect on story perception. This discussion continues today (Conditt, 2016; Franklinn-Wallis, 2016), leading to questions whether the freedom to look around and/or participate in a 360-degree virtual world enhances a film experience or not. The argument

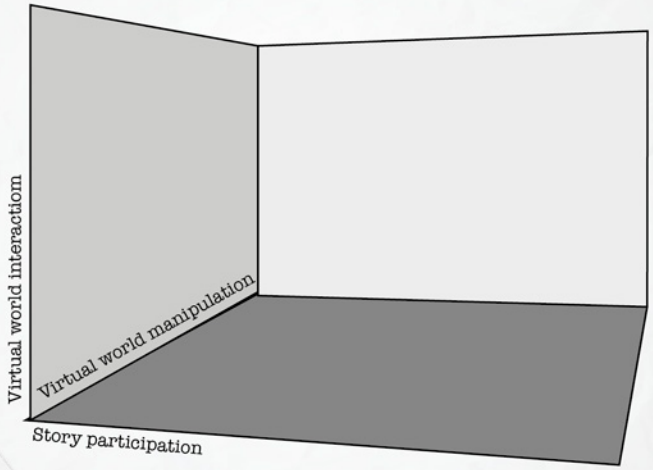


Figure 6: VR Participant Framework

here centres on the lack of 'sender' control and therefore a decrease in experience and 'receiver' comprehension of how a story unfolds. Existing and new frameworks have been suggested, for example, to categorize different types of story participation levels based on the linearity of the narrative, the audience storyline presence (acknowledgement) and narrative influence dimensions (Bye, 2016). And/or to compare mediated experiences based on the amount of user-system interaction, such as real-time navigation and manipulation (IJsselsteijn, 2013). The less the audience is able to participate in the story, the more it seems connected and in line with traditional film media. The more interaction and manipulation possibilities, the more VR seems to move towards being regarded as a medium within the game domain. In addition, it is important to take into account challenging control issues once VR begins to develop from a 'one-to-one' medium towards a 'one-to-many' medium (IJsselsteijn, 2013). Allowing more than one user to participate in the story and/or have control over the environment will position VR closer to multiplayer games or participatory theatres and further from individual media such as print.

We have conducted several preliminary studies on interaction and control (story participation) effects to understand the role of VR as a medium for creating and experiencing short movies. The results revealed, among other things, that viewers enjoy a VR film regardless of the point-of-view (POV) taken by the audience, although an 'actor' POV seems to enhance feelings of spatial presence compared to an 'observer' POV (Van den Boom, Stupar-Rutenfrans, Bastiaens, & Van Gisbergen, 2015). In addition, the results indicated that despite an increase in viewer distraction due to less sender control (more audience freedom to view and interact in a VR setting), story comprehension remains relatively intact (Syrett, Calvi, & Van Gisbergen, in press). It should be noted that these studies also revealed problematic measurement issues due to the newness of the VR medium. As participants have no or little experience with VR (HMDs), it is very likely that they demonstrate atypical VR behaviour. Inexperienced VR users seem to be relatively more curious about and explorative within the VR experience and greatly enjoy the experience precisely because of the newness factor.

The aforementioned examples are based on the technological dimensions of VR. However, VR was not invented to increase interaction or to provide more control of or the ability to manipulate the mediated content. Nor are audience needs based on technological media features. Instead, they relate to the conceptual dimension of VR, which concerns creating immersive experiences: wanting to be present in environments that do not exist, or are difficult to access in the real world and that do not feel 'real' when experienced via existing media (especially when it comes to non-existent worlds). The sudden arrival of VR might alter our perception of mediated experiences and might even change how we categorize media according to its experience. However, it is very difficult to compare media on the basis of these more conceptual dimensions of VR such as experience. Who is the 'big one' when it comes to creating an experience? Would that be print, theatre, cinema, TV or VR? This question brings forward new challenges related to definitions and the measurements of experiences across media.

Goal 2: To examine the functionality and effects of VR within a media context

Due to the increase in VR usage, an important goal is to measure and compare experiences in virtual worlds with experiences generated via traditional media. But what should we measure? On the one hand, we can argue that for the sake of comparability it is best to choose an experience measurement that 'fits' all media, leading to generic dimensions related to emotions and evaluation. On the other hand, it might be better to measure types of experiences that best fit the specific medium.

Context experience challenges

Concerning VR-specific experience, the dimensions that are often used relate to presence, naturalness and immersion. These are dimensions that we do not often come across in studies of print experiences, or in the comparison of brand experiences. However, they do seem to be related to some dimensions used within the domain of film, such as absorption, engagement and flow. These dimensions have been used to further develop new scales to compare experiences between media. Examples can be found in the recently published dissertation by my new colleague, Miruna Doicaru, who compared aesthetic and narrative experiences of print and film (Doicaru, 2016). Nevertheless, many of the scales used to measure presence in virtual worlds do not seem suitable when comparing experiences or feelings of presence across media or with 'real reality' (Usoh, Catena, Arman, & Slater, 2000). To measure and compare experiences between VR media as well as between VR and traditional media, we frequently use the validated ITC-Sense of Presence Inventory (ITC-SOPI) (e.g. Peeters et al., 2012). The ITC-SOPI is a cross-media questionnaire designed to measure and compare feelings of presence - sensations of 'being there'- that are generalizable to a variety of mediated environments (Lessiter, Freeman, Keogh, & Davidoff, 2001). The scale consists of four factors: Spatial Presence, Engagement, Naturalness and Negative Effects. The first three factors represent the sense of being in a physical, spatial environment as well as the evaluation of the appeal and believability of the virtual world. Negative effects relate to items such as dizziness, disorientation and nausea. Although the four factors cannot be combined into one overall experience score, using the ITC-SOPI scale allows us to measure important experien-

ce components during and after VR participation and compare these across different media (e.g. Khan et al., 2016). Initiated among by former ADE lector Hans Bouwknegt and others, in 2010 ADE started a SIA (RAAK PRO) funded project called 'User Experiences in Virtual Realities' (Bouwknegt, 2012). I joined this project as an industry partner in 2010, working as a research director at DVJ Insights, before becoming a research manager at ADE in 2012. In collaboration with knowledge partners such as Radboud University (Department of Communication Science) and TU/e (Department of Industrial Design) as well as industry partners such as Media Republic, Heinz, Brandloyalty, Talpa, POPAI and Nokia, we created and tested different virtual worlds and tested different VR context situations and technologies that might be used to measure experience and behaviour (e.g. Hühn et al., 2011; van 't Riet et al., forthcoming). These measurements and the virtual supermarket that we created have since been further developed by the Medialab licence holder Atoms2Bits. Using the ITC-SOPI scale and other measures we, together with students, measured the experiences of approximately 1,500 participants aged between 17 and 65 who visited different virtual worlds primarily in a CAVE setting. The results revealed high levels of engagement, presence and naturalness as well as negative effects due to technological limitations (Van Gisbergen, & Bouwknegt, 2013). Moreover, negative effects such as nausea

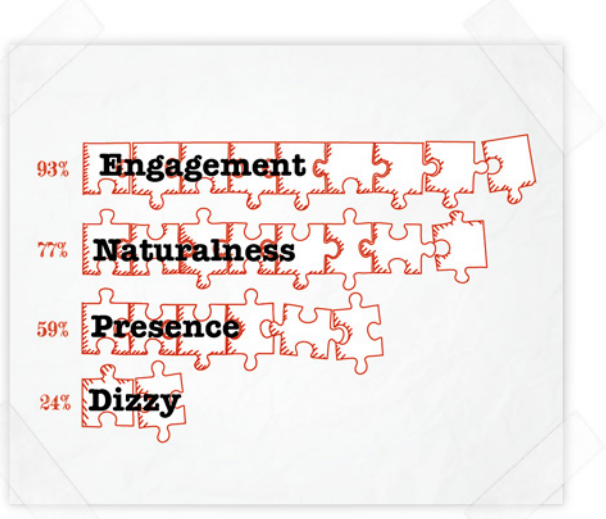


Chart 1: CAVE & Oculus (DK1) Experience (n = 1,500)

indeed seem to cause negative experience effects resulting in lower presence, naturalness and engagement scores. In addition, the results indicated that the same virtual world is experienced differently depending on the VR medium used. Comparing experiences in a CAVE setting with an HMD (the Oculus Rift Development DK1), the results suggested that while presence is relatively more enhanced using an HMD, feelings of naturalness and engagement are stimulated more in a CAVE setting (Van Gisbergen, & Peeters, 2015).

However, more research is needed, as different types of virtual worlds and prior VR experience could not be taken into account, and CAVEs as well as HMDs have been further developed and optimized in recent years. It has also been argued that the use of questionnaires is not sufficient to measure presence evoked by virtual reality experiences (Slater & Garau, 2007). A questionnaire cannot measure presence (or changes to it) during the experience, nor can it be ruled out that presence effects occur simply due to the fact that questions are asked about it. To overcome these problems, more objective physiological measures that indirectly capture virtual reality experiences and or behaviour can be used, such as heart rate, skin conductivity and brain activation-related techniques, ranging from EEG to fMRI (for an overview see Clemente et al., 2013). Having said this, problems may also arise with indirect measurements. Firstly, they relate to the content: what is measured when nothing exciting or entertaining happens within the virtual world? Secondly, they relate to context issues: How do you establish an overarching experience score based on indirect measurements and compare this across different media? Currently we are developing a new NHTV wide research theme 'Designing and Managing Experiences'. New research facilities, ranging from EEG to mobile wearable sensors, will be tested and used to observe experience and emotion effects. In doing so, we will build on previous knowledge, including that obtained in the ADE project 'Biometric Design for Casual Games' (SIA/RAAK funded) and 'Sensors at Play projects' (STW funded) (see for instance Gomez et al., 2014). In these projects, biometric measurement devices were tested in their relation to their capacity to measure experience and behaviour in games. We will continue to work on different VR cross-media experience measurements in an interdisciplinary

team of experience and emotion researchers and game and VR content developers. This, however, brings forth a second context-related challenge: how to compare media content-wise.

Context content challenges

While on the one hand, we might want to compare media effects using the same content for all media, on the other hand we want, and often need to, compare media effects based on content that has been adapted to or newly created for each separate medium. As previously discussed, there are three options: (a) use the same content, (b) adapt the content or (c) create new content. The same content is often used for practical reasons (cost-efficiency) as well as to avoid the comparison of apples and oranges. Adapted or newly created content is often needed to make the content suitable for the medium, or wanted to better take into account the specific role and features of the medium. In the latter situation, the content can only be found within one medium or is adapted to such an extent that we would consider it different or unrecognizable (as often happens when a book is translated into a movie or a movie into a game). The possible effects of the type of content on choices were demonstrated in a study described by McLuhan (1964, in which a difference in teaching performance across media was found among students, and this was related to whether or not the content was adapted to a specific medium. In the 'similar content' condition, the same information was communicated at the same time by the same person for the same duration in each medium. In the 'adapted content' condition, "each medium was allowed full opportunity to do its stuff" (p.311). In the adapted condition, content for radio and TV was dramatized using auditory and or visual features. For print lay-out, features were added while blackboard technology and class discussion options enriched the lecture content. In both content conditions, TV and radio scored better compared to the other media. However, while TV scored best when the same content was used, radio performed best when the content was dramatized. The explanation, according to McLuhan, is that a higher degree of medium participation increases learning. Mcluhan argued that TV needs less audience participation (message completion) compared to radio. While dramatization increases audience participation for radio, it reduces participation for TV (decreasing learning effects).

We do acknowledge the apparent paradox in suggesting that, for the sake of comparability, we should measure experience the same way for each medium, while at the same time arguing that we need to measure different experience dimensions, related to a specific medium, using content that varies according to each medium. However, as we gain greater insight into what and how to measure experience, we will also be better equipped to explore how best to connect VR with traditional media. In doing so, we will take into account a very important tip on how best to assemble a jigsaw puzzle: "Don't try to make the pieces fit; if they don't get there [sic] easily, it's because they do not belong in that position" (Wiki-how, n.d.).

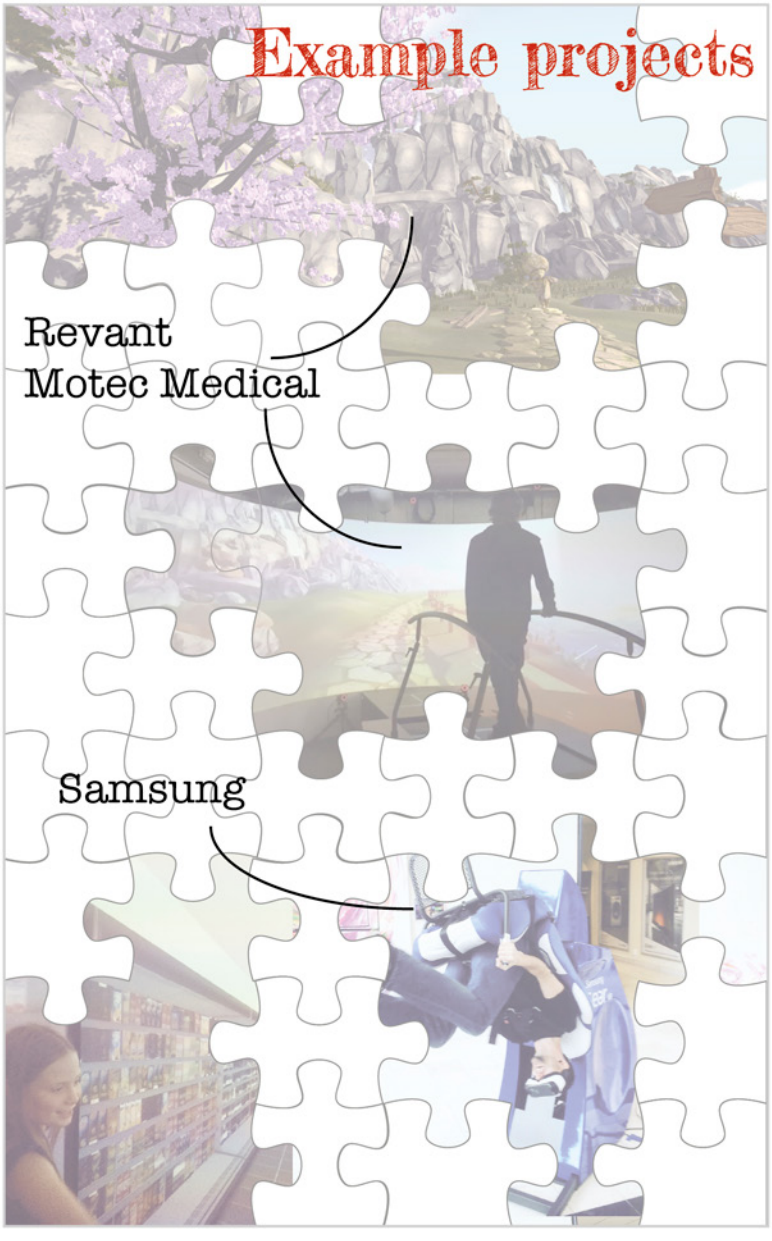
Goal 3: To explore how we can use context to connect virtual reality with other media

The third goal we would like to achieve is to help organizations connect VR with existing media. Over the past fifteen years, I have been trying to simplify the complex media landscape using existing as well as new media typologies (e.g. Van Gisbergen, Hoogervorst, Kreek, & Witteman, 2014). For the very simple reason that due to the rise of new media, it has become very complex to define and distinguish media. A challenge I experienced when working for a research company. For several years we monitored media behaviour among young audiences (13-29) for our clients (Van Gisbergen, De Zwart, Jansen, & De Vos, 2009). However, at a certain point is was unclear whether we referred to the same thing as our clients and participants, for example when we asked them to report television-viewing behaviour. Did this merely refer to linear viewing time on traditional TV devices an/or non-linear viewing using recording and streaming devices, or also new content watched online via for instance YouTube or Netflix? For this reason I have also carefully avoided a discussion of how to define and distinguish VR as a 'medium'. I indirectly referred to VR as a medium when describing the content -in which case VR creates a particular 'believable' experience'- as well as when describing VR as a combination of technologies resulting in a device (ranging from CAVEs to HMDs). However, the complexity only increases, as VR seems to be able to mimic all traditional media, becoming a so called 'metamedium' (Kay & Goldberg, 1977). Although 'perfect virtual reality' has not been achieved, it is already possible to go to the cinema, watch

television, read a book or play games on a console in a virtual world as 'if it was real'. In copying the context of traditional media, VR seems to have become even more than a 'metamedium' (although it will be quite difficult to find a term that surpasses the term 'metamedium'). Instead, I have been arguing that VR already acts as a medium simply because 'we' put it there. To understand VR as a medium is difficult, then, without grasping its relationship to other media.

To illustrate how to connect VR with 'other' media pieces, we return again to the metaphor of a jigsaw puzzle. A helpful starting point in assembling a jigsaw puzzle is to build a framework and start sorting and arranging pieces in terms of their form and content, for example, based on tabs and blanks or colours and objects printed on the pieces (Wiki-How, n.d.). This means that organizations must be able to describe the experience they would like to create and start arranging the media pieces accordingly. We aim to help organizations to understand and describe VR experiences and as such how to differentiate this form, as well as connect it to the creation of a brand, movie or game experience (Van Gisbergen, Bialkova, De Feijter, & Bonenkamp, 2016). In addition, the combination of the technological context related dimensions should be used to position the role of VR while taking into account how this will change existing media roles. We need to understand the added value of the experience by VR and comprehend how the specific combinations of technologies can be used. If we do this, we can more effectively decide how to apply media orchestrating strategies that include multimedia, crossmedia and transmedia strategies, as well as perceptual organization principles from Gestalt theory such as proximity, closure, symmetry, continuity and similarity.

Currently, we are working on different VR projects within the creative domain as well as in other domains such as branding, architecture, tourism and healthcare. Regardless of the domain, ADE will always look for the added value of entertainment in creating VR experiences. I will list a few example VR projects in which we create VR experiences as well as measure, compare and connect experiences across media.
Together with Thomas More University (Belgium) and MMEx (Denmark), we recently (2016) started a new Creative European



Culture funded project called 'TRACES'. The project is aimed at helping museums to develop and implement digital strategies to reach new audiences. Within this project we will create workshops to demonstrate, as well as further explore, the additional value of VR experiences for museums. Combining digital (transmedia) storytelling strategies with game technology insights, we continue to build upon research conducted within NHTV (e.g. Calvi et al., 2015) and the partners involved. At the same time, we are working together with students and industry partners such as Musica Nova (composers), to create VR museum experiences while testing different story participation, sensory options (e.g. interactive music) and user-control possibilities (different movement possibilities).

Also, in 2016 we started a structural collaboration with SAMSUNG, creating a multidisciplinary team in which insights into technology, media, management and entertainment experience are used to create and test new VR concepts (Van Gisbergen, 2016). This collaboration has already resulted in one of the first VR movies created with the SAMSUNG 360 degree camera, which is not yet commercially available in the Netherlands (Luistercijfersnl, n.d.). Using the five adoption dimensions and the VR participant framework as well as experience insights, we will try to position SAMSUNG VR media within the VR domain as well as connect it with other media. In addition, we will create specific entertainment concepts that best fit VR GEAR, launching a VR-Jam with SAMSUNG, among other envisioned outcomes.

Initiated by Revant, Motek Medical and myself, a group of talented game students is creating an entertaining VR game as a means to improve rehabilitation processes. The VR game is specifically being created for the 'GRAIL'; a gait analysis and gait training instrumented connecting virtual worlds to a dual-belt treadmill and synchronized EMG, video and motion-capture system. We will study the added value of entertainment, attempt to connect the VR game with other training possibilities and compare experiences created in GRAIL with experiences created in other media and VR devices.
In collaboration with Radboud University Nijmegen, including the Tailored Persuasive Communication Group, we will continue our research using VR environments to explore positive con-

textual persuasive communication strategies related to health, youth, 'growing characters' and data-privacy challenges. Under the supervision of my colleague Professor Igor Mayer, ADE game students have developed a collaborative game (an escape room) in an immersive VR room within the Daf technology lab of Tilburg University. Research questions relate to the understanding, construction and added value of different types of collaboration within different types of VR devices (CAVE versus HMD).

We recently started a VR contextual connection study with our Brazilian partners. Together with the Federal University of Santa Catarina (Department of Graphic Expression), we are investigating ways in which VR can improve and connect experiences within transmedia entertainment worlds, such as the 'Rotfather' created by Monica Stein (therotfather.com). International collaboration is also present in the European Horizon 2020 funded Greenbubbles project (ww.greenbubbles.eu). In this project we will create a VR sustainable diving experience. We will measure the added value of a VR experience as part of a new overall media strategy and business model with the goal to involve recreational SCUBA divers and companies to help create a sustainable diving environment. Students and staff have also been working on 'Spatial Context Experience Simulation' concepts related to cycling and walking. These VR concepts are connected to research lines initiated and supervised by our colleagues from the Academy for Urban Development, Logistics & Mobility in collaboration with Utrecht University (part of the internationally funded project DEPICT), the Academy of Hotel & Facility Management and in partnership with Atlantis Games BV, who have created the VR bike experience (CycleSPACES).

Students are, of course, also working on VR entertainment related concepts, business models and media strategies which they have initiated themselves. These projects are developed under supervision of ADE staff who have a proven and impressive track records within the entertainment industry. In addition, although not discussed within this inaugural lecture, we will conduct research related to VR related social, health, ethical and IP dilemmas. Research questions concern the ownership of virtual realities and the extent in which we are allowed to manipulate virtual worlds, that represent, or even act within, 'real' environments, objects and people. These questions have become more relevant as we are staying longer within virtual worlds -current world record is 25 hours (Beal, 2016)- as well as we will become more experienced in the development of 'real' objects and people. It makes me enthusiastic, as well as nervous, to help my colleagues acquire new technologies that will be used to digitally capture you.

Presentation Keurmerkstylist (2016): VR & Interior Design

PUTTING THE PIECES TOGETHER

Dear audience. I have provided you with an outline of the three research goals within this professorship, related to contextual connected media and VR. I hope that the overview of VR developments within the five adoption dimensions has convinced you of the importance to include VR in the media research portfolio. In addition I would like to believe that I have increased your understanding of what VR is. Arguing that VR is a fluid piece within the media jigsaw puzzle. A piece that creates a mediated experience in which feelings of immersion and presence can differ depending on the combination of technologies used. By defining four VR technology dimensions -sensory, interaction, control and location-, I created a framework that can be used to compare and pinpoint media on this VR continuum. In addition, I hope to have persuaded you to always take a media context into account when creating content for VR. Simply as VR is, and always will be, surrounded by media that inevitably influence our perception of the functionality and role of VR. By explaining how VR experiences can be measured and compared across media, and by outlining context related framework dimensions, I have tried to create some points of departure for future VR research and content developments.

We are just beginning to explore the potential of VR to reach and engage audiences across different platforms. I hope you will follow us in our VR exploration, based on the idea of Gestalt, and together with us commit to the idea of 'lean research': to conduct research and create content at the same time. This VR exploration is something I did not foresee. At the age of 11, I wrote my first VR paper for a school project. sadly, I stored this project on those big 5¼-inch floppy disks, which are rather difficult, if not impossible, to access these days. At that age, it was solely based on how I imagine future VR devices and content would look like, relying on books and patents released by companies such as Google and Sony. Thirty years later, I have arrived at a place where we study and create VR, while trying to put the media pieces together. Who would have guessed, it's a dream come true. Hence, there are several people I would like to thank for making this possible.

ACKNOWLEDGEMENTS

I would like to start by expressing my gratitude to NHTV, especially the members of the Executive Board Hein van Oorschot (president) and Nico van Os, for appointing me Professor of Digital Media Concepts. You have created a culture within NHTV that reflects the so called 'golden triangle': a good balance between education, research and industry. I would like to thank our dean Daphne Heeroma, for creating an applied research environment within ADE. Dear Daphne, thank you for your trust in me and for continuing this professorship, making it one of the most long-lasting professorships within NHTV. You were the first boss to put me in a position in which I was officially expected to 'start bossing myself around', combining the role of professor and research manager. I would also like to thank my fellow MT members, Bruce, Will and Frans for their great collaboration, as well as Mariska for her tremendous support. I will miss our MT discussions, although I will definitely pop in during MT meetings to continue to ask for more research time for our staff. Of course, I will do that together with my new fellow professors. Dear Igor and Mata, I look forward to bringing to life our ideas on research and innovation activities, creating engaging, playful experiences in Digitally Enhanced Realities (DER). I am looking forward to continue working with our researchers and partners on newly acquired VR project within the contextual connecting media research line. I would like to thank all those involved in the funded research projects we have engaged in, and in particular Niels for helping me manage these projects. I also want to extensively thank all researchers, partners and students involved in the RAAK PRO subsidized project 'User Experiences in Virtual Worlds'. This project was a huge stepping stone to making VR research within ADE possible. I would like to express my gratitude to my NHTV colleagues; you remind me every day that the proof of the pudding is in the eating, regardless of whether the pudding is real or virtual. The incredible range of experience that you have when it comes to the creation of games and digital media, and which you transfer to our students, will help us to come up with new ideas, provide new directions for testing and will create innovative VR concepts. Dear students, the examples and pictures I showed, do not do justice to the amazing content you have created and the research you have conducted.

Of course I thank my family and friends. In particular my close relatives and parents. You are witnesses and enablers of my professional career and personal life. A special word of thanks to Paul Ketelaar, a very good friend and life-long research companion, a research collaboration that continues today in VR projects. My final word of gratitude is to my wife Susan and my daughters Minne and Luna. Thank you for your support, and getting me out of the virtual and into the real world when needed. No experience instrument will be able to measure the absurd amount of love that I feel for you.

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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

ABOUT THE AUTHOR

Marnix van Gisbergen (1974) is professor of Digital Media Concepts and the manager of Business Innovation & Research at NHTV University of Applied Sciences (Academy for Digital Entertainment). With an international team of media researchers and game developers, Marnix is involved in several innovative media-related national and European-funded projects on topics such as virtual reality, human body sensors, transmedia and new media business models. Currently, his main research interest is focused on helping organizations realize a virtual-reality strategy based on media-context connectivity. In 2006 Marnix received his PhD (NWO grant) in Communication Sciences at Radboud University. In both his current and previous work as a lecturer/researcher at Radboud University (1998-2006), he has been involved in over 100 BA and MA-level student graduation projects. As a research director (2005-2012) of the research agency, DVJ Insights, and the youth company, YoungVotes, he was responsible for the initiation and management of media-related research projects for over 75 brands. Marnix has published in numerous national and international magazines, presented at international media and communication conferences and given workshops for companies to among others transfer research insights into practical new concepts. Marnix was nominated for the AMMA award for best media related-research (2014), the Pfizer Press price (2010) and the MOA Dutch Market Researcher of the year award (2009).

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