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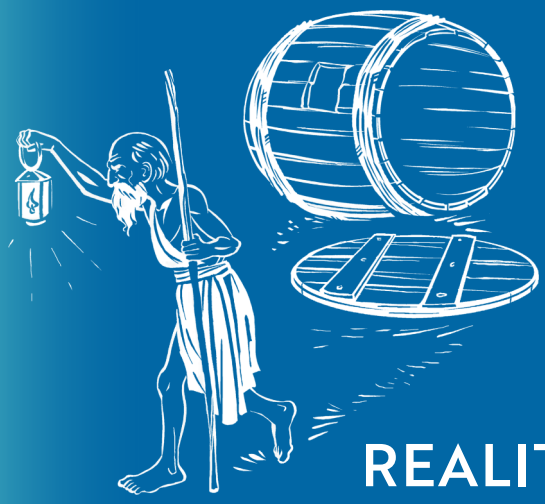

# REALITY GUIDES FOR LIFE BEFORE DEATH

Tomi "bgt" Suovuo

TURUN YLIOPISTON JULKAISUJA – ANNALES UNIVERSITATIS TURKUENSIS
SARJA – SER. F OSA – TOM. 12 | TECHNICA – INFORMATICA | TURKU 2022

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# REALITY GUIDES FOR LIFE BEFORE DEATH

Tomi ”bgt” Suovuo

**ACADEMIC DISSERTATION**

To be presented, with the permission of the Faculty of Technology of the University of Turku, for public examination in the Auditorium XXII, Agora building on 22.6.2022, at 12.00

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*To all the teachers in my life.*

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## ABSTRACT

The rise of the digital game industry has brought along a plethora of game design tools and frameworks. They are likely to be named specifically as design frameworks for games because their creators have been positioned themselves on the field of game research due to their personal interest in games or due to the fast rising game business. There appears often not to be a reason why these tools and frameworks could not be used in any other kind of interaction design too.

Furthermore, even the definition of a game is elusive. In effort to be able to consider what is a game and what is not, the concept of Reality Guides was developed. A Reality Guide guides the user in their surrounding reality. By its definition it is not necessarily a game, and a game by its definition is not necessarily a Reality Guide, but it is possible for something to be both. Reality Guides can come in the form of paper booklets, human guides, digital applications, or something else. The focus in this thesis is in guides that are mixed reality digital applications.

Looking at Reality Guides through several game design frameworks, a new theoretical model was constructed: The GEM Game Experience Model is a result of Grounded Theory based work to find a single underlaying model behind all the existing ones.

Two non-game initiatives have been worked on with the guidance of Reality Guide thinking and GEM thinking: Life Before Death aims at producing services that will help people with premature end of life circumstances to make the best possible out of their remaining life. Reality Guides for the end-of-life. Also, in the initiative of creating a community around Digital Theology a project course was organized using gamer community originated Discord as a central Reality Guide for the course participated by students from four continents.

KEYWORDS: Game research, Co-design, Reality Guides, End-of-life

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## TIIVISTELMÄ

Digitaalisten pelien markkinoiden kasvu on tuottanut useita eri pelisuunnittelutyökaluja. Nämä työkalut ovat osoitettu nimenomaan pelikehitykseen siksi, että niiden kehittäjät ovat profiloineet itsensä pelitutkimuksen alalle, johtuen heidän omasta mielenkiinnostaan pelejä kohtaan, tai markkinoiden nopeasta kasvusta. Usein ei kuitenkaan näy varsinaista syytä sille, miksi näitä työkaluja ei voitaisi käyttää yleisemminkin minkä tahansa vuorovaikutuksen muotoiluun.

Jopa itse termi ”peli” on häilyvä. Jotta voitaisiin arvioida mikä on peli ja mikä ei, kehitettiin tämän väitöskirjatyön puitteissa todellisuusoppaiden (Reality Guide) käsite: Todellisuusopas on jokin joka opastaa käyttäjää häntä ympäröivässä todellisuudessaan. Määritelmällisesti todellisuusopas ei välttämättä ole peli, eikä peli määritelmällisesti ole välttämättä todellisuusopas, mutta jokin voi hyvin olla kumpaakin. Todellisuusoppaat ovat paperivihkoja, ihmisoppaita, digitaalisia sovelluksia, ynnä muita. Tässä väitöskirjassa keskitytään oppaisiin, jotka ovat sekoitetun todellisuuden digitaalisia sovelluksia.

Tutkailemalla todellisuusoppaita useilla eri pelisuunnittelutyökaluilla luotiin uusi teoreettinen malli: GEM (”Game Experience Model”) -pelikokemusmalli luotiin ankkuroidun teoriankehitysmetodologian periaatteiden mukaisesti etsimällä todellista kuvaa näiden työkalujen taustalla.

Todellisuusopas- ja GEM-ajattelun avulla on työskennelty kahden ei-peli-hankkeen parissa: Elämä ennen kuolemaa (”Life Before Death”) pyrkii tuottamaan digitaalisia palveluita auttamaan ihmisiä terminaalivaiheessa saamaan parhaan mahdollisen loppuelämän. Siis todellisuusoppaita kuoleman varjostamaan todellisuuteen. Lisäksi digiteologian yhteisön luontihankkeessa järjestettiin etäopetuksena projektikurssi, jonka todellisuusoppaana pääasiallisesti käytettiin pelaajayhteisöstä noussutta Discord-palvelua todellisuusoppaana neljältä eri mantereelta oleville osallistujille.

ASIASANAT: pelitutkimus, co-design, todellisuusoppaat, elämän loppu

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Thank you to professors Tapio Salakoski and Olli Nevalainen for guiding me on pre-graduate and graduate paths of my academic life journey. My supervisor Jouni Smed has my grateful admiration of opening the doors into game research. I am also in debt of gratitude towards my third supervisor, Erkki Sutinen, who has shown me the rest of the way towards this doctoral thesis, and beyond.

I have also had the privilege to be surrounded by several other inspiring co-authors and colleagues. Natasha and Petter Skult have created a beautiful book of Handbook on Interactive Storytelling with me and Jouni Smed. Kyle Schiefelbein-Guerrero has provided me with a mind expanding insight to academic life in California during my three month stay at GTU in Berkeley. All academic researchers are students by definition, and by spreading the results of their studies they are all also teachers.

I thank my parents Heljä Suovuo and Heikki Mäntylä, and my grandparents Soile and late Aarni Suovuo for setting me on the path of my very life, giving me books of all sorts in my hand on early years of my life, showing me how to design and build things as well as allowing me to examine, explore and become curious of all designs. As for the dedication of this book, Aarni-pappa has been the first of teachers in my life by his career as a teacher, as well as my mother by her career as a childminder.

Last, and most importantly, I want to thank my dear wife, Riikka Suovuo. We are sharing our lives together and provide each other invaluable support. We have both learned much from each other and forever will. In the fiction of interactive and non-interactive storytelling, and in the reality of life we are sharing joys and adventures. This doctoral degree is just one of them.

21.5.2022
*Tomi ”bgt” Suovuo*

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# Concepts and Abbreviations

DSR **Design Science Research** – a three cycle methodology by Hevner and Chatterjee (2010) to improve the workings of an organisation by changing the tool used to the work, while preserving other factors as constant.

DT **Digital Theology** – an umbrella term denoting a multidisciplinary endeavour to explore the intersection between theology and information technology encompassing a range of perspectives, methodologies and approaches. (Suovuo et al., 2021)

GEM **The GEM Game Experience Model** – a framework for analysing game play experience by understanding the six part anatomy of the experience. (Suovuo et al., 2020)

GPS **Global Positioning System** – Satellite based global system to measure a devices position in relation to Earth.

LBD **Life Before Death** – a cross-disciplinary research initiative whose goal is ”to design a digital artefact for adult people in a terminal stage of illness or injury to help them make the best possible out of the remaining life they still have.” (Suovuo et al., 2022)

RG **Reality Guide** – an application that aims at assisting, teaching or supporting the user in their surrounding reality. (Suovuo et al., 2016)

TAM **Technology Acceptance Model** – a theoretical model by Venkatesh and Davis (2000) to explain why new technology is or is not taken into actual use.

**Agile Methodologies** — a group of methodologies, such as Lean, Scrum and eXtreme Programming, where design is done with minimal rigidity for maximal efficiency and optimal outcome.

**Co-design** – a design philosophy formulated by Sanders and Stappers (2008), where the designer, researcher and end-user are working together throughout the whole design project, instead of working for each other, each at their own turn.

**Gamification** – applying game design features in non-game design.

**Psychoanalysis** – a system of theories on the field of psychology that is based on Sigmund Freud's theory of mind from the 1890's, but was mostly replaced by behaviourism in the early 20th century.

**Thanatechnology** – technology that guides us on issues of mortality. (Sofka, 1997)

# List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

I Tomi ”bgt” Mäntylä, Ilmari Lahti, Harri Ketamo, Mika Luimula and Jouni Smed. Designing Reality Guides. In *6th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES)*, IEEE, 2014, pages 1–8.

II Tomi ”bgt” Suovuo, Ilmari Lahti, Jouni Smed. Game Design Frameworks and Reality Guides. In Handbook of Research on Gaming Trends in P-12 Education, IGI Global, 2016, pages 85–104.

III Tomi ”bgt” Suovuo, Natasha Skult, Tapani N. Joelsson, Petter Skult, Werner Ravyse and Jouni Smed. The Game Experience Model (GEM). In Bostan Barbaros (editor), Game User Experience And Player-Centered Design, Springer Nature, Los Angeles, CA, USA, 2020, pages 183–205.

IV Tomi ”bgt” Suovuo, Kyle Schiefelbein-Guerrero, Jani Koskinen and Erkki Sutinen. Designing Terminal Encounters with Erikson and Kübler-Ross for Life Before Death. Thanatos, 10(2), 2022, pages 6–24.

V Tomi ”bgt” Suovuo, Jonas Kurlberg and Erkki Sutinen. A Hands-on Course on Co-design for Digital Theology. In Theo Bastiaens (editor), Proceedings of Innovative Learning Summit 2021, Association for the Advancement of Computing in Education (AACE), 2021, pages 474–483.

# 1 Introduction

When doing any particular type of design, in addition to the type specific design principles, there are also general design principles that can be applied to almost any type of design. For example, for co-design it is irrelevant whether the design type is software design, space rocket design, service design, or any other type of design. The principles of co-design still apply: involving the planners, the implementers and the end users at every point of the process of coming up with ideas, making them into reality and eventually testing the final design.

Furthermore, there are general design principles in most every type specific design framework, which can be applied in any other type of design, and often even the type specific principles can be some way applicable in general. This also pertains to the applicability of game design frameworks and tools, in more general interaction design. To demonstrate this, a concept called Reality Guides was conceived.

When designing future technology, an important question is, what technology will actually end up being accepted into common use. The attitudes arising since the beginning of the COVID-19 isolation would appear to show that a lot of pre-existing online teaching methods will only now end up being established as a standard practise even in normal circumstances. Regardless of the availability of feasible technology, a lot of it has not been accepted as a common practise, before a significant need now appeared. The basic Technology Acceptance Model by Venkatesh and Davis (2000), as depicted as a part of Figure 1 could explain this. It could be hypothesized that although new ways of teaching might be more efficient, the procedure of changing to them is at least perceived more complicated that what the *perceived usefulness* would be. Now this change has been inevitable, which has directly affected the *intention to use*, as well as the *perceived usefulness* and *perceived ease of use* in the new circumstances has increased.

Outside of such exceptional circumstances, this basic reluctance of harnessing new innovations has to be addressed by other means, which is where Technology Acceptance Model 2, as depicted in the rest of Figure 1, provides tools for. One approach is to explore the users' subjective norms and shape the design more appealing to those. To really gain access to the subjective experience and understanding of the end-user, a simple and effective way is to involve the end-user in the design process, preferably throughout the whole process. This is the key element of co-design, where in addition of the end-users, also the theory builders, designing engineers and

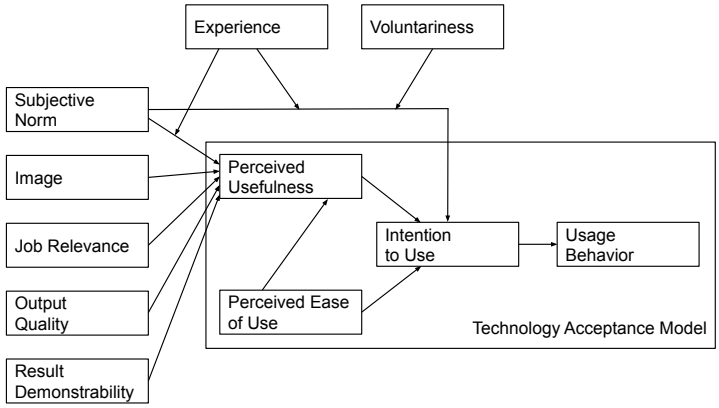


**Figure 1.** The Technology Acceptance Model 2, including the original Technology Acceptance Model. (Venkatesh and Davis, 2000)

implementing constructors are all involved in each step of the way of the design (and implementation) process. (Venkatesh and Davis, 2000; Sanders and Stappers, 2008)

## 1.1 The design of games and gamification

Wittgenstein (1958) used the concept of games as a good example of a term in language that escapes perfect definition. In the English language the term ”game” can mean, for example, a children’s play activity, hunted meat, or a form or event of sports. Also in Finnish the word for ”game” (”peli”) has very different alternative meanings, such as a musical instrument (in ”pelimanni”), a tool (in ”pelit ja vehkeet”) or a machine (in ”menopeli”). No matter how one attempts to formulate a precise definition for ”a game”, it is relatively easy to come up with an example that can generally be agreed to be a game and yet not completely fulfil that definition, or alternatively an example that clearly is not a game, but would fit the definition.

The Global Positioning System (GPS) becoming everyday accessory in mobile devices and the computing power on the mobile devices in general increasing at the beginning of the millennium laid grounds for augmented reality games. Google company Niantic was commercially leading the way with the launch of Ingress in 2013, which was then followed by more popular Pokémon GO in 2016. (Laato, 2021)

Typically, in academia, game research is easy to see as something that investigates digital entertainment, and as such can be considered quite light and unimportant. However, the budgets and productions of modern AAA games (games produced by big, well esteemed studios with high budgets) easily compare to modern Hollywood movie production, which has reached a status of one of the seven forms of art.

One of the most complicated question is: What is art (Ryynänen, 2020, Preface)? Outside of the full weight of art history for the term and concept, one could consider art to be something that aims to convey aesthetics. Note that aesthetics is not only about ”beauty”. The easiest way to understand the concept of aesthetics, is to consider its antonym, ”anaesthetics”. Anaesthetics is well known from medical care, where anaesthesia is applied in varying degrees to a patient going through uncomfortable symptoms and treatments, especially surgeries. Anaesthesia is being used to draw away sensations and awareness. Mild anaesthesia suppresses the sense of pain. Full general anaesthesia renders a person completely unconscious for the duration of an operation. Aesthetics is the opposite of this. It is the richness and completeness of all senses, emotions and thought.

Aesthetics is an inseparable part, if not the whole point of entertainment games. Looking at established art forms, such as theatre, cinematics, visual arts and music through the GEM model, I am concurring with the insight expressed in the preface of Smed and Hakonen (2017, Preface) that games are emerging as the 8th form of art.

In effort to look into game design frameworks and their applicability in game design on one hand and in non-game design on the other, not only does one need to define what is a game, but also what is something that is not a game. While the first definition can be attempted through the GEM-model that is described later in Chapter 3, the concept of Reality Guides, as given in the next Chapter, can be used to identify cases of the latter. One could, of course, pick just any objects that do not match the GEM game criteria, but Reality Guides narrows the group down to a more homogenous group, where all objects are similar to each other in several parts, except for the part of some of them being games and others not.

## 1.2 The design of thanatechnology

Thanatechnology is technology that can help us understand and approach death and dying (Sofka, 1997). Such a circumstance may be the most alien reality most everyone has to encounter. In the book Being and Time, Martin Heidegger (1927) characterizes the human perception of existing – of being alive. This experience consists of the combined experiences of memories of the past and expectations of the future. This can be seen as an infinite existence, where we tend to live like we were immortals. The comprehension of oneself dying – ceasing to exist, is next to unthinkable.

Although we can have experienced the death of others in our life, this experience is always external (Heidegger, 1927) and not truly conceivable for us, the outsiders. Designing services for people in such circumstance is thus challenging. Also, not only is this reality out of our understanding, it is also stressful, as it reminds us of our own mortality, which we tend to avoid thinking.

In the contemporary world, as already foreseen by Sofka (1997), the go-to place for people in search for answers, is the Internet. Hence, the importance of thanatechnology is remarkable. The traditional sources of answers – religions and their services, must also be discoverable on-line. This again, brings forth the further need for digital theology.

## 1.3 The design of this thesis

The research question of this doctoral thesis is:

> RQ: What is the practical scope of game design frameworks beyond the design of entertainment in form of games?

The question is mostly qualitative, but for the part that it is quantitative, the null hypothesis is:

> H0: Frameworks intended for game design do not provide significant use for non-game design.

The answer to the question are sought from extending the utilization of game design tools and frameworks towards thanatechnology, in the Life Before Death initiative, and digital theology.

This thesis is based on five quite distinct papers that form a continuity in time, providing systematically an answer to RQ. The research questions, methodologies and outcomes of each individual original publication are shown on Table 1.

This doctoral thesis convenes a narrative of my scientific work between 2014–2021, as seen in the five papers selected to this collection. Chapter 2 reviews and concludes papers I and II. The work in these two papers has led to the creation of the concept of Reality Guides as well as the GEM model, which was published in paper III and is discussed in Chapter 3. The GEM model supports the design in the Life Before Death initiative, discussed in Chapter 4, based on paper IV. The Digital Theology initiative is a natural continuation for Life Before Death, as discussed in Chapter 5, supported by paper V.

Chapter 6 is the future work section of this publication. Its title reflects the same subtle sense of humour as the multi-interpretational title of this whole thesis. I am sustaining a balance between the gravity of death as a subject and light heartedness of using titles. This is both characteristic of my own personality, as well as typical for people in professions involving death. It sets standards for the professionals who need to respect the emotions of their clients and the community as a whole, provide them with proper forms of comforting, while also sustaining their own mental health on the side of daily encountering people's peril. (Grandi et al., 2019)

**Table 1.** The research design of the original publications.

| Paper | Research questions | Methodology | Outcome |
|---|---|---|---|
| I<br>Designing<br>Reality Guides | How to analyse and design reality guides? | Case study. | The paper demonstrates the application of three game design frameworks on three Reality Guides. |
| II<br>Game Design Frameworks and Reality Guides | Why are game design frameworks specifically for game design? | Case study. | Most game design frameworks are conceived by personal experience and enthusiasm towards game development. They are not systematically constructed, but they are useful. They are also useful in interaction design beyond games. |
| III<br>The Game Experience Model (GEM) | What is the ”Grand Unified Theory” of game design? | Grounded Theory | The GEM model fuses together five game design frameworks in approach of the ”Grand Unified Theory of games” |
| IV<br>Designing Terminal Encounters with Erikson and Kübler-Ross for Life Before Death | What is the taxonomy of desires of a person during life before death? | Grounded Theory | The fusion of Eriksons' and Kübler-Ross's theories provides a new, single theory. |
| V<br>A Hands-on Course on Co-design for Digital Theology | How effective is the application of modern technologies and modern working methods for on-line project course on digital theology? | Case study | The technologies and methods are well applicable. |

# 2 Reality Guides

A Reality Guide is something or someone who aims to assist, teach or support the user in their reality. This includes games, such as Pokémon Go, Hattrick, Ingress, as well as non-games, such as FourSquare, Life Before Death, GPS navigators and Neil Harbisson's cybernetic sense of colour (Else, 2012). The term collects the concepts of traditional city guides, restaurant guides, etc., which can be in forms of living people, paper brochures, or digital services.

Where the two following chapters will describe two actual artefacts designed in the research work described in this thesis, this chapter discusses Reality Guides which could be seen as a preceding design. It is not itself an artefact, but a concept to be identified in the empiria. The concept was introduced in the original publications I and II.

## 2.1 What is and what is not a game

Computer Science as an engineering science, until recently, has greatly valued quantitative methods over qualitative methods. Practical Science has been held in higher esteem over Humanities, Social Sciences and other "Soft Sciences", especially where they have been conducting qualitative studies. This is ironic in relation to how the engineering sciences also greatly respect people such as Newton, Turing and Archimedes, who all are known mostly for the results of their qualitative studies rather than quantitative.

A proper quantitative study in science should typically involve an experimental group and a control group, where the two are otherwise similar, except for the one quantitative variable, the effects of which are analysed. As software engineering is very new and highly evolving field, it is difficult to find properly identified equivalents within it. What would be a suitable control group when the sample group consists of "games"?

The game research field in academia has been empowered by Ludwig Wittgenstein (1958) having used specifically the word "games" as a primary example on how terms and concepts in commonly accepted every day use of language are vague in their definitions. Even further, he can be seen actually as gamifying the investigation of language and speech by using the concept of "language-game" throughout the book to discuss their behaviour.

The traditional, Linnaean taxonomy suffers from the fact that the classification of organisms is based on external examination of the organisms, rather than the internal building of DNA and evolutionary tracking. The software engineering equivalent of this issue boosted the conceptualisation of Reality Guides. For the study of propagation of technical debt, we needed a taxonomy of software applications that was based on the tools and working methods required to produce different types of applications, in effort to formulate a control group and experiment group. The control group needed to contain applications, whose design work was to be considered equivalent to the experiment group, except in that the experiment group utilized Facebook API identification functionality, whereas the control group did not. (Suovuo et al., 2015)

The Wittgensteinian questioning can be continued: What is a guide? Guides are small pamphlets you can find at the tourist information center and at museums. Guides are people, who join you to guide you through cities and museums. Guides are recordings – audiobooks, if you will – that you take with you to listen to instead of an actual person. And more and more these days, guides are digital applications and services.

At the initial conception of Reality Guides the definition of game was based on Adams (2013) and Ermi and Mäyrä (2005). These frameworks stated essentially four channels of immersion that are specific for games: Sensory immersion, Challenge (or action) based immersion, Strategic immersion and Narrative based immersion. Sensory based immersion entails that the user is presented with such impressive (possibly in their realisticness) aesthetics that they forget about everything else. Narrative based immersion occurs, when the story of the game is so intriguing that the player wants nothing more than to learn what happens next. Challenge based immersion entails that a game is most immersive, when it demands maximal focus in game actions that are possible for the player with their skills.

A significant difference between reality guides and games is that the aim of a game is to give the user – the player, a proper level of challenge, so that the user has something to try to achieve, whereas a guide in its optimal performance is invisible. It becomes a part of you. There is no hindrance – no challenge in using it. One could say that an optimal guide is directly a part of the user's own knowledge and awareness. In a non-game applications, rather than aiming for sufficiently high challenge, the aim is essentially to completely remove the challenge from the performance. This could invoke flow. Flow occurs, when work is progressing smoothly and almost effortlessly, if not even on its own momentum (Csikszentmihalyi, 2008, loc 1223). Yet, it must be interesting – not tedious, which can come from overcoming challenges, but more likely from interesting narratives, which once again distinguishes it from positively challenge based immersion which occur in games. To gamify a Reality Guide, unpredictability and curiosity motivators can be added in

the application without compromising the focus on supporting the user in the guided reality (Chou, 2013). (Suovuo et al., 2016)

## 2.2 Mixed reality

A lot of Mixed Reality applications are Reality Guides, but not all. For example the Google Cardboard application ”Dinosaurs Everywhere!” (Useless Creations Pty Ltd, 2015) augments the user's reality by displaying dinosaurs walking around the user. However, the user has no way of interacting with these dinosaurs and the dinosaurs do not interact with the user. Hence the application is not assisting or supporting the user, not even in a game-like virtual reality of the dinosaurs, and it is not either teaching the user anything about these dinosaurs that only serve a decorative purpose in the augmented reality of the application.

The Wittgensteinian challenge of determining the gameness of an application can be tackled by looking into the features focused on by frameworks intended to improve game design. In Mäntylä et al. (2014) we applied the initial fusion of Adams (2013) and Ermi and Mäyrä (2005) models. The results of this are shown on Table 2.

The conclusion in study I is that Reality Guides are low on *rules*, the *space* consists of the reality they are guiding the user in, and the *stories* arise also from the guided reality. In the paper, we described the stories as being enriched by social media, but in hindsight it would be because that is where the real life, everyday

**Table 2.** Gameness of three Reality Guides

| | Rules | Story | Space |
|---|---|---|---|
| Lost Turku | Not many. Expandable to social media. | Non-narrated fantasy of the historical past | **Single fixed location in real world with a time window view to different directions.** |
| Vares | Not many. Visit physically fixed locations in real world. | Presents narratives from the original books and movies. | **A set of fixed locations in real world, displaying fictional narratives there.** |
| Mapping Energy | **Find locations in real world and mark labels for energy sources. Evaluate labels by other players.** | Only meta-narrative. | Game space corresponds with real world GPS map. |
| RG in general | A few rules | Story from the reality | The realm of the guide |

stories are being told, as well as where people visiting the realities of museums and other, are telling their stories. This is laid on the bottom row of Table 2.

Now later on, the GEM model would suggest the replacement of the term ”rules” by ”mechanics&action”, ”story” by ”storyworld&narrative” and ”space” by ”aesthetics&sensory stimulus” (Suovuo et al., 2020). More specifically, ”space” would be fused into ”mechanics”, and a new perspective would be considered for ”aesthetics&sensory stimulus”.

Where Wittgenstein considered the definition of what is a game and what is not, an intersecting question in game research is the definition of a story. Aarseth (2012) perceives games as interactive stories, as can be seen on Table 3. Aarseth dissects a story into two types of plot elements: Kernels and satellites. Kernels are plot elements that cannot be changed without changing the story. An example of a kernel is from the Little Red Riding Hood, where the wolf eats Little Red Riding Hood's Grandmother. If this doesn't happen in the story, it is not the same story. Satellites are plot elements that are optional. In the same story, when Little Red Riding Hood asks the Wolf about the big ears, it is a satellite. It is a kernel that there has to be at least one of these questions, typically: ”What big and sharp teeth you have!?” More questions are a matter of style in telling the story. There may also be a satellite, where Little Red Riding Hood meets the Hunter on her way to Grandmother's house, but it is a kernel that the Hunter comes and rescues her.

If the interactor can affect neither the satellites nor the kernels of the plot, Aarseth calls the story a linear story. If the interactor can affect the satellites, but not the kernels, it is a linear game. If the interactor can choose from alternative kernels, but not affect the satellites, it is a non-linear story, but if here the satellites can be affected, it is a quest game. Aarseth does not see it possible that kernels would be fully under the control of the interactor, but satellites not. If the kernels are fully in the interactor's control, then the satellites are too, and it is a pure game.

In the GEM model we have even more generally found narratives and story world as an inseparable part of a game. Aarseth addresses from the perspective of narratology, games as an enigma, whereas Ermi & Mäyrä find ”imaginative immersion” as one of the three key dimensions of gameplay immersion experience. The story of the game has the current narrative with its beginning and end, as well as the wider story world surrounding it.

**Table 3.** Using kernels and satellites to differentiate stories and games. (Aarseth, 2012)

| **Kernel influence** | **Satellite influence** | |
|---|---|---|
| | ***Not possible*** | ***Possible*** |
| ***No influence*** | Linear story | Linear game |
| ***Choose from alternatives*** | Non-linear story | Quest game |
| ***Full influence*** | N/A | Pure game |

We discovered that the three investigated Reality Guides have either full influence on the kernel of the story, or the user can at least choose from alternatives. The only way for there to be no influence on the kernel would be that the user is forced to pass through the guided reality without any alternative to affect it. This is the case for people traveling in public transportation, where the reality guide is explaining by schedule what is currently in the vicinity. In somewhat equivalent cases of, for example, museum tours the participants can ask the guide to pause and explain more, or in some cases even skip some points of interest, if the tour group has no interest or time for them.

The study II further considered the connectivity of Reality Guides to social media, which was reflective to the approach of Suovuo et al. (2015) considering the impacts of Facebook API changes into the technical debt of social media connected applications. This connectivity is natural for Reality Guides, as in the digital era it is customary for many to post their experiences in social media. This linking has followed the Reality Guide approach into the considerations of approaches in Life Before Death. Although people easily shun the idea of involving social media in something as intimate as the approach of a personal peril, it nevertheless is the current standard of human communication and narration.

Once the ideas of game design frameworks and Reality Guides were initially explored in Mäntylä et al. (2014), a more thorough investigation of the applicability of the frameworks was studied in Suovuo et al. (2016). Reality Guides were here defined as ”applications that aim at assisting, teaching or supporting the user in the real world.” This specific formulation was somewhat sloppy, as the more exact focus on the *reality surrounding the user* is more precise. Even, when the user considered in Suovuo et al. (2016) was guided in museums, the guidance certainly focused more on the reality attached to the exhibit items in the context they were presented, rather that describing how the object was placed inside the museum, how it had now been brought in there, and what would happen to it after the user's visit was over – the user is being immersed in a narrative reality and guided within there.

A central reality guide application for Suovuo et al. (2016) was Foursquare City Guide (Foursquare Labs Inc., 2009), which indeed assisted the user in the real world. This application was a popular service of social media, where visitors in shops, restaurants and other services notified of their visits there and gave ratings in scores and written descriptions. Based on this activity it was possible for the user to find out where there is a lot of activity, or where to find good food or other services, as recommended by other users.

The concept of Reality Guides shows that game design frameworks are conceivably applicable ”beyond the design of entertainment in form of games”, as stated in the RQ and proposing the rejection of H0. In the next Chapter, H0 is more practically tested by constructing a new game design framework that combines together several earlier ones, and yet can more clearly also be applied in the design of non-games.

# 3 Game Experience Model

Inspired by the discovery of the multitude of different, but non-conflicting game design frameworks while conducting the studies I and II, we gathered together an even bigger set of frameworks in the original publication III, and conducted a grounded theory like study on them. The outcome of this study was the Game Experience Model GEM. (Mäntylä et al., 2014; Suovuo et al., 2016)(Smed and Hakonen, 2003; Björk and Holopainen, 2004; Hunicke et al., 2004; Adams, 2004; Ermi and Mäyrä, 2005; Adams, 2013; Smed and Hakonen, 2017)

## 3.1 The shoulders of the giants

Martin Heidegger (1945, loc 2013–2254) considered the positivistic search of truth in a fictional, Platonic dialogue. The argument goes that truth tends to escape those who either ignore finding it altogether, as well as those who strive towards it with great effort. His solution was to be released (*gelassen*) into truth by abiding (*verweilen*) mindfully. This argument is compatible with the Grounded Theory method, where the researcher gathers data and then attempts to objectively see what is formed when contradictory outliers are discarded and patterns repeating in several samples are taken (Niekerk and Roode, 2009). Best practises of the scientific method are to be abided, with the hardest challenge in the confirmation bias – it is easier to identify either affirmative evidence in the data, or contradicting evidence than it is to identify objectively what really is there. It is, as said in The Methodist Quarterly Review in 1858, about the methods of sculptors and poets: ”finding the perfect form and features of a goddess, in the shapeless block of marble; and his ability to chip off all extraneous matter”, which has later been turned into a more memorable form in its cheerfulness: ”[To sculpt an elephant,] get the biggest granite block you can find and chip away everything that doesn’t look like an elephant” (Quote Investigator, 2014). The GEM model was chipped out from the block of existing models as follows:

The similarity of the Ermi and Mäyrä (2005) SCI-model (Sensory/Challenge/Imaginative), Adams (2013) model and the Hunicke et al. (2004) MDA (Mechanics/Dynamics/Aesthetics), as shown in Figure 2, sparked the initial interest to seek for the underlaying true picture of reality and create model closer to it.

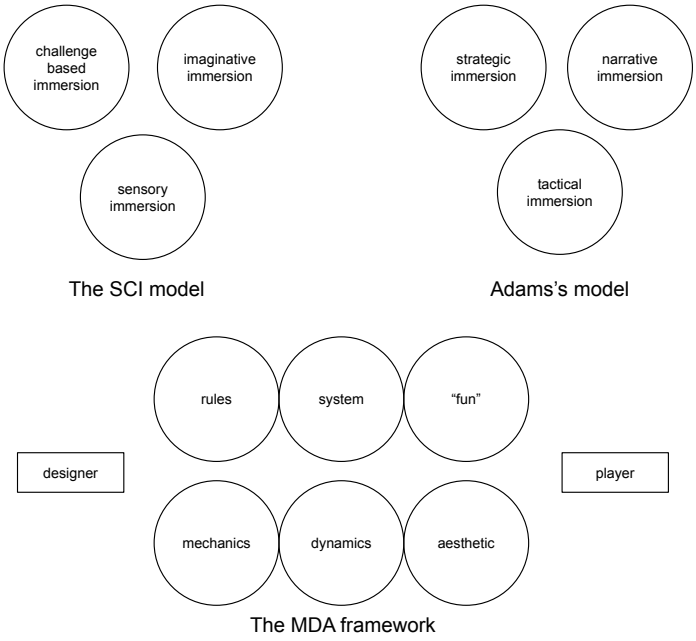


**Figure 2.** The SCI, MDA and Adams's models

The SCI-model and Adams's model both identify three channels of immersion in the game experience – immersion modalities one could say. One of these channels is through the story. Ermi and Mäyrä call it *imaginative immersion*, and Adams calls it *narrative immersion*. A good story carries the reader of a book away into the realm of the story, and the reader finds it difficult to put the book down instead of turning one more page to see what happens next. Adam's model has two more channels that essentially are both similar to the SCI-model's *challenge based immersion* channel. The *challenge based immersion* in the SCI-model finds that when the game poses a suitable level of challenge to the player, they are motivated to focus on overcoming the challenge and "winning the game". Adams divides this into *strategic immersion*, where the player has to consider the wider picture of the game situation to eventually win the whole game, and into *tactical immersion*, where the current move within the game poses a motivating challenge. The SCI-model also considers the *sensory immersion* through sounds, visuals and other as an important channel, which seems to be missing from Adams's model. The MDA-model's *mechanics/rules* can be matched with the *challenge based* and the *strategic channel* of the earlier two. *Dynamics/system* matches better with Adam's model's *tactical channel*, but could be seen somewhere between the SCI-model's *challenge-based* and *sensory channels* as well. *Fun/aesthetics* can be matched with *imaginative* and *sensory channels*, as well as the *narrative channel*.

We applied the afore mentioned principles of Grounded Theory, taking these frameworks and theories as data. This motivation was further increased when it turned out that Mäyrä's extension to the SCI-model, the Contextual Game Experience Model Mäyrä (2007) had discovered in the game research field something very similar to what Falk and Dierking (1992) (and later Falk and Dierking (2013)) had discovered for museum experience design. The Interactive Experience Model that focused, not explaining a game play experience, but that of visiting a museum – "art, history, and natural history museums; zoos; arboretums; botanical gardens; science centers; historic homes; and a variety of other exhibits and collections." The fact that two teams separately, in different fields, came up with such similar models for humans experiencing games or museums, suggests two thigs: 1) there is something essentially true in these models, and 2) the underlaying truth does not only concern game play, nor does it only concern museum visits. It concerns meaningful experiences – including the experience of utilizing a reality guide.

Notably, the Contextual Game Experience Model is not a part of the building materials of GEM, as is not Vahlo et al. (2017) operating on similar level, as they both consider the play experience on a higher level, taking in consideration the context of the player. Like the SCI-model was placed within the Contextual Game Experience Model, the GEM-model is situated within a contextual reality, such as described by Mäyrä (2007) and Vahlo et al. (2017).

Patterns in Game Design by Björk and Holopainen (2004) was inspired by the work of Gamma et al. (1995) in collecting a set of "design patterns" to assist in the practical design work of software engineering. Their own contribution was a collection of "game design patterns", out of which the ones involving immersion were chosen to compare with the above three frameworks. "Spatial immersion" relates to imaginative and narrative immersion introducing the whole actual world of stories behind the ones that are told – in the fashion of open world games. "Emotional immersion" relates to sensory immersion with the narrative immersion, but expand this concept further towards more wholesome aesthetics – MDA's aesthetics and dynamics. "Cognitive immersion" is described as something that combines very nicely the SCI-model's imaginative and challenge channels. The fourth one, "Sensory-motoric immersions" is quite identical with the Adams's tactical immersion and following the line of SCI-model's challenge based channel, and the MDA-model's dynamics.

Bartle (2005) and Aarseth (2012), as well as Vahlo et al. (2018) focus more on experiencing the story and less on experiencing sensory experiences. This aligns conveniently with Adams's model's lack of sensory input channel. Bartle originally built his taxonomy on the heavily text based MUD (Multi User Dungeon) games with only rudimentary visual presentation. Aarseth focuses even deeper just into stories, with only titling certain types of interactive stories as "linear games", "quest games" and "pure games". Bartle's and Vahlo's interests lie more in understanding

the players and their motivations, whereas GEM focuses on the core of the game play experience as it is taking place.

## 3.2 GEM

GEM is a model, which describes the anatomy of game play experience as it happens. The structure of GEM is shown in Figure 3. Aptly, one can perceive the model like a transparent crystal, where the substance within – the *Fantasy* is the game play experience. The crystal has five facets and six vertices. The vertices depict the six different channels of immersion into the game, and the facets serve as different perspectives into the experience: *theatre*, *dynamics*, *simulation*, *experienced fantasy* and *designed fantasy*. The vertices are set in two circles of three: *mechanics–storyworld–aesthetics* and *action–narrative–sensory stimulus*. These two circles are joined by pairwise edges between the vertices: *mechanics–action*, *storyworld–narrative* and *aesthetics–sensory stimulus*.

*Mechanics* is the set of all possible actions that can take place in the *fantasy*. It is, essentially, the metaphysics of the game universe. In chess, the *mechanics* include, e.g. ”taking an opponent’s piece”, ”elevating one’s own piece”, and ”checking the opponent’s king”. In car navigator, the *mechanics* include, e.g. ”planning a route to destination” and ”informing the driver to take a turn”.

*Action* is the counterpart of *mechanics* that includes all the actions that can be made to apply the *mechanics*. In chess, the *actions* include, e.g. ”moving a piece on the board from a square to another by hand”, ”taking a piece off the board and placing it to the side” (”taking the piece” mechanics), and ”verbally declaring ’check’ to the opponent” (as part of the opponent’s king checking mechanics). In car navigator, the *actions* include, e.g. ”the navigator uttering a verbal instruction to take a turn” (”informing the driver” mechanics), and ”the user using the touch screen keyboard to enter a street address as a destination” (as part of the ”route planning” mechanics).

*Storyworld* includes all stories and events that have happened, are happening, will happen, could have happened and could happen within the *fantasy*. In chess, the *storyworld* includes e.g. the reason of the conflict being simulated in the game, the reason why there are these six types of pieces in the game, and the well known game openings. In a car navigator the *storyworld* includes, e.g. all the possible destinations one could be guided to, and all the possible combinations of the utterances by the devices, even those that are programmed into the device, but never heard by the driver, if the driver, e.g. has never driven onto a ferry to cross a river, where the navigator has very situation specific utterances prepared.

*Narratives* is the counterpart of the *storyworld*, consisting of the stories that are told on the course of the experience. The *narrative* of a chess game has a formal mean of recording it, turn by turn, while the *narrative* is actually being told on the game board, as the players take their turns and the involved *actions* of their choice.

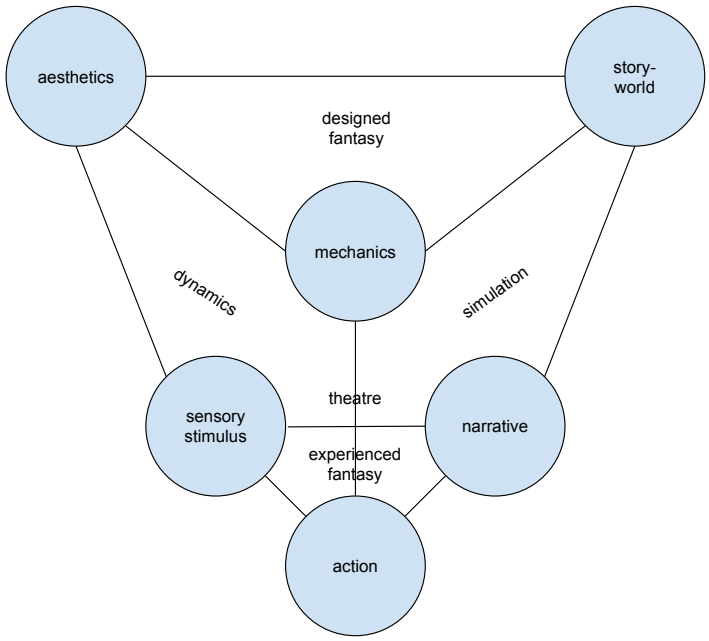


**Figure 3.** The GEM Game Experience Model

The *narrative* with a car navigator involves the experience of driving from a place to another, following the instructions, and possibly finding a road construction site and having the navigator re-plan the route.

As explained in Chapter 1.1, *aesthetics* is a greatly misunderstood term. The *aesthetics* of the chess is, e.g. in the style of the game pieces, in the mood of the place where the game is being played, and in the pace of the game, which can vary from a few minutes time constrained quick game to a game played through letter exchange over a span of several months even. The *aesthetics* of a car navigator lie e.g. in the selected tone of speaking voice, the formulation of the spoken instructions, and the graphical design of the displayed map and route.

As with the previous couples, the *sensory stimulus*, as a counterpart of the *aesthetics* is more mindful, actualising representation of the *aesthetics*. E.g. in chess, the shape and material of the game pieces, experienced by the players looking and touching them, and seeing how the opponent makes their moves with the pieces on the board. In car navigator, the *sensory stimulus* consists of, e.g. the sound of the navigator speaking – its tone and quality, and how the display looks like with the immediate route suggestion displayed over the map.

The facet between *mechanics*, *storyworld* and *aesthetics* shows the *designed fantasy*, where the interaction designers have the greatest agency. They choose the *aesthetics* they want to convey to the interactors, as well as the reality in the *storyworld*,

both of these in connection with the metaphysics of the *mechanics*. The stories within the *storyworld* should not go against the possibilities provided by the given set of *mechanics*. The overlaying *aesthetics* can make, in the same *storyworld* and *mechanics*, the difference between a comedy and a tragedy, based on the seriousness or the light heartedness of the presentation.

The opposing facet between *action*, *narratives* and *sensory stimulus* is the *experienced fantasy* – what the user primarily experiences. The *designed fantasy* can be seen there through the *fantasy*, but only as seen through the user's *experienced fantasy*. Through perceptions and misconceptions the whole *storyworld* is revealed to the player, easily having a different form than what the designers had in their minds. Depending on the successfulnes of turning the intended *aesthetics* into *sensory stimulae*, the user will gain the intended aesthetical fantasy of the story. (As a counter example, in Star Trek the Next Generation, the Ferengi were originally designed to have the *aesthetics* of the threatening main adversary, but they were experienced as ridiculous and amusing, so their role design was officially changed in the *storyworld*. (Reeves-Stevens and Reeves-Stevens, 1997)) The designed set of *actions* required from the user provide a challenge level in the experience, but also plays a vital role in conveying the *narrative*, as well as the *sensory stimulus* to the user. The user interacts with the *narrative* by taking *actions*, and sees the consequences of those *actions* through the provided sensory *stimulus*.

The GEM model is designed particularly for games through the mechanics of its building materials all having been intended for game design. In addition to analysing and improving game design, the GEM can be also used to define whether something is a game or not. If something is a game, it involves all six channels, and if something involves all six channels, it is a game. When some of the six elements are missing, the interaction system is something else than a game.

When ignoring the *mechanics* and *actions*, and looking at the *fantasy* through the opposing facet, the system is something akin to *theatre* or cinema. There are perceivable *mechanics* and there are *actions* being taken, but when the user experience is limited to just observing the *storyworld* and the *narratives*, with the involved *aesthetics* expressed by the *sensory stimulus*, it is equivalent to being a member of the audience in a chess tournament, or going to see a theatre play.

Ignoring the *aesthetics* and *sensory stimulus*, the system is a *simulation*. In cases of digital systems, it is a mathematical computer simulation. *Mechanics* based *actions* are taken, which can be collected into *narratives* actualising from among all the possible narratives in the *storyworld*.

Ignoring the *storyworld* and *narratives*, the system is a *dynamic system* – possibly perceivable as a piece of abstract art conveying *aesthetics* by rule based events. A kaleidoscope and many desktop toys, as well as a lava lamp are typical examples of this kind of systems.

Reality Guides provide a *narrative* from the *storyworld* of the guided reality. The reality cannot really be *acted* on within the system much as such. Driving a car to a location and doing things there will not affect the GPS navigator. There is only the narration of going there. Also for the *aesthetics* and *sensory stimulus* it suffices that the user can hear and understand the guidance. Also a person guiding groups through a museum is still a guide even if their lecturing would not be charismatically inspiring and interesting. To gamify the guidance, some *aesthetics* may be added by including music or an exiting mystery story into the storytelling. For car navigators the assuring tone of the spoken instructions and clear visuals focus on improving this part of the GEM. In *mechanics* and *action* the museum tour can include a treasure hunt or just interactivity into the guidance. The car navigator could, for example, ask the driver to guess how many traffic lights there are in a given segment of traveling currently going on, or it could even involve the driver in the routing by giving alternative options and explaining their downsides and benefits. Outside of that, the essence of Reality Guides consists only of *narratives* of journeys within a given *storyworld*.

Giving proper consideration to these particularities of Reality Guides, GEM can be applied to the design of Reality Guides, and thereby to the design of Life Before Death. The difference here from applying GEM to actual games is actually not that significant, as all games too have their own particularities to consider on GEM. A slow turn-based strategy game is quite different from full body acrobatics challenging, fast paced dance game.

”However, digital games are a subclass of digital applications, and thereby the GEM is applicable on a more general area as well. For serious digital applications, the storyworld is the business environment where the application will be used, for example, a corporate organization or a study life of a student.” (Suovuo et al., 2020) Other than that, mechanics is the set of involved regulations, activities, procedures and protocols followed in the serious activity. Aesthetics involves the etiquette of the work, as well as graphical guidelines, involved values.

With the GEM model we now have a proper game design framework to apply as the RQ concerns. What is needed next for testing the hypothesis is a Reality Guide to try the framework on. In the next chapter the design of Life Before Death, as a Reality Guide for the end-of-life reality is discussed.

# 4 Life Before Death

Life Before Death (LBD) is a cross-disciplinary research initiative whose goal is: ”To design a digital artefact for adult people in a terminal stage of illness or injury to help them make the best possible out of the remaining life they still have.” Thus, LBD is an item of thanatechnology – technology that guides us on issues of mortality. (Sofka 1997) Furthermore, it is a Reality Guide (Mäntylä et. al. 2014, Suovuo et. al. 2016) to help people understand their remarkably changed reality as they are facing death. (Suovuo et al., 2022)

Considering cognitive realities, the end-of-life period, or in other words the life before death is one of the most alien ones that are reachable essentially just by a change of attitudes. The typical attitude a person has towards their life is the one of immortality – their life is never going to end. Upon learning of having a terminal condition, people according to Kübler-Ross's model of grief find themselves in denial as the first stage of grief, as they still try to hold on to the reality where they are incapable of dying. (Suovuo et al., 2022)

As we were exploring the psychological theories for life before death, we encountered a piece of digital thanatechnology called WeCroak, which sends the users five times a day a quote that reminds them of their mortality (Uslander, 2018). The idea of the applications is to help both people in their regular life, as well as people in a stage of grief or mourning. The afore mentioned illusion of immortality is delusional, and it can make people find better value in their lives when they remain mindful of their own mortality. This is compliant with the philosophy of Martin Heidegger, advising people to accept their own mortality in effort to make the best out of their remaining life. (Suovuo et al., 2022)

Guiding, and even designing the guidance for this reality is also an emotionally stressing task. To ease this work, we thought it convenient to have just a single psychological model to follow when trying to understand this reality. Hence an effort somewhat similar to the construction of the GEM was taken in the original publication IV, using two well established theories.

## 4.1 Psychology

Two classic psychological theories from psychoanalysis discuss the end of life and the involved grief. One is Eriksons' stages of personal development and the other is

Kübler-Ross's stages of grief. Considering that these both theories are still widely referred and we were really not able to find later established equivalents, they were chosen to begin with.

Erikson and Erikson (1998) identifies eight stages of personal development throughout life, plus the final ninth stage. The first eight stages all involve a conflict to be resolved and related ritualisms. The succesful resolution of a conflict produces a strength. For example, on the first stage, at the age of approximately 0–2 years old, a person is mainly experiencing *basic trust* that is threatened by *basic mistrust*. These experiences cause a conflict in a person's development, which when successfully resolved will provide them with the basic strength of *hope*, but upon unsuccessful resolution can lead to the antipathy of *withdrawal*. All eight conflicts and their related strengths are listed on Table 4. (Stillion and Attig, 2014; Erikson and Erikson, 1998)

The final, ninth stage differs from the others in that it doesn't have it's own conflict or ritualism, but rather during this stage a person reprocesses all the conflicts of the previous stages, but in a reverse configuration. During the first eight stages a positive attitude is threatened with a negative attitude, such as the basic trust in the first stage being threatened by mistrust. At the ninth stage, a person is facing the end of life, end of everything, and in the disposition of threats apparently surrounding one everywhere. The challenge now is to overcome these threats by discovering the positive resolution.

**Table 4.** The conflicts and gained strengths of life stage conflicts according to Erikson. (Erikson and Erikson, 1998)

| **Life Stage** | **Conflict** | **Strength** |
|---|---|---|
| 1. Infancy | Trust vs. Mistrust | Hope |
| 2. Early childhood | Autonomy vs. Shame, Doubt | Will |
| 3. Play age | Initiative vs. Guilt | Purpose |
| 4. School age | Industry vs. Inferiority | Competence |
| 5. Adolescence | Identity vs. Identity confusion | Fidelity |
| 6. Young adulthood | Intimacy vs. Isolation | Love |
| 7. Adulthood | Generativity vs. Stagnation | Care |
| 8. Old age | Integrity vs. Despair | Wisdom |

Kübler-Ross and Kessler (2005) identify five stages typical for grieving people. These are stages are *denial*, *anger*, *bargaining*, *depression* and *acceptance*. Unlike the common strong conception, these five stages are not necessarily processed in any given order and one after another. The given order is the most clearly logical one, but not necessarily so for each case, and even further, a person may be simultaneously in multiple of these stages. The important thing is the content of these stages. For example, in *anger* the person directs strong emotions outwards, essentially suffocating all available feedback, and thus easily resulting in isolation from others.

When processing these theories with the principles of Grounded Theory, it can be found that each five of Kübler-Ross's stages finds a counterpart in the strengths attained in different stages of Erikson's theory, as shown in Figure 4. Denial corresponds with Love. Anger corresponds with Will. Bargaining corresponds with Purpose. Depression corresponds to Hope. And finally Acceptance corresponds to Wisdom. Competence, Fidelity and Care are left outside these connections. Interestingly these stages are also considered to be in nearly the same order in both theories too. Table 5 shows the resulting 13 categories of thoughts and emotions predicted by the fusion theory.

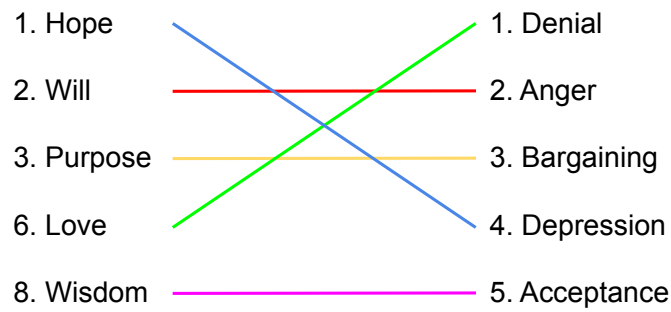


**Figure 4.** How the five stages of Kübler-Ross connect with five stages of Erikson.

Looking at the Life Before Death theory of human psychology through GEM, it looks like the mechanics of this reality. The 13 categories of thinking each represent a cognitive process of a grieving person. There is the connection to the narratives of the person's story world through the process of these mechanics and their related actions turning into a story, as in a *simulation*. The mechanics and actions of grief are interpreted through the aesthetics of the person's attitudes towards life, and they result into concrete expressions of shedding tears, breaking things or sharing closeness and even laughter within the *dynamics* shared with those close to the person. Yet, the psychological model is best understood as the mechanics behind the "*theatre* play" of these people's lives, where "all the world's a stage, and all the men and women merely players", as beautifully worded by William Shakespeare (1623). Mechanics, in the sense of the GEM-model channel that present the main functionalities behind what is expressed outwardly through the *sensory stimulus* and personal *narratives* presented externally to others. (Suovuo et al., 2020)

**Table 5.** The fusion of Erikson's and Kübler-Ross's theories.

| Category | Erikson | Kübler-Ross |
|---|---|---|
| 1. Expectations | 1.a Hope (1st stage strength) | 4 Depression, 4th stage |
| 2. Power | 2.a Will (2nd stage strength) | 2 Anger, 2nd stage<br>2.b Outward directed (anger) |
| 3. Worth | 3.a Purpose (3rd stage strength) | 3 Bargaining, 3rd stage |
| 4. Interruption | 6.a Love (6th stage strength) | 1 Denial, 1st stage |
| 5. Reasonability | 8.a Wisdom (8th stage strength) | 5 Acceptance, 5th stage |
| 6. Trust | 1.b Trust vs. Mistrust (1st stage conflict) | 4.b, 4.c Impending losses and false hope (Depression) |
| 7. Control | 2.b Autonomy vs. Doubt (2nd stage conflict) | 2.c Loss of control (Anger) |
| 8. Guilt | 3.b Initiative vs. Guilt (3rd stage conflict) | 3.b, 4.a.iv "If only's" (Bargaining, Depression) |
| 9. Involvement | 4.b Industry vs. Inferiority (4th stage conflict) | 1.c Avoiding others<br>1.d Being excluded (Denial) |
| 10. Disbelief | 5.b Indetity vs Confusion (5th stage conflict) | 1.b Disbelief (Denial) |
| 11. Presence | 6.b Intimacy vs. Isolation (6th stage conflict) | 1.a Disconnection with reality<br>1.c Avoiding others (Denial)<br>5.c Non-verbal communication (Acceptance) |
| 12. Heritage | 7.b Generativity vs. Stagnation (7th stage conflict) | 2.a Interrupted life (Anger)<br>4.a Losing what one had (Depression) |
| 13. Serenity | 8.b Integrity vs. Despair (8th stage conflict) | 5.b The calm acceptance (Acceptance) |

## 4.2 Guidance in the Reality of End-of-Life

To design a Reality Guide, a thorough understanding of the guided reality is needed. This requirement is focal in interaction design, and we often find a convenient methodological package of three methodologies which each address it: We use agile methods to do Design Science Research with co-design (Hevner and Chatterjee, 2010; Sanders and Stappers, 2008). All the three methodologies aim to assist particularly in designing for unfamiliar environments.

The agile methodologies can be seen as the opposite of the ”waterfall” method, where all the theoretical research is done first, then all the planning is done for the design, then the completed plan is followed in construction of the design, after which any possible faults are tried to be fixed through testing, before the whole design is considered ready and at last given to the users to see and take in use. The proponents of agile methodologies see this as a certain plan for failure. The future cannot be perfectly predicted. Perfect planning for the whole design before any implementation is hugely laborious and error prone, if not completely impossible. Problems in the plan easily arise during implementation, and at that point the plans should not be fixed, as they essentially are in the pure waterfall method. Testing may easily reveal even more understanding, how the plans should be improved. Finally, an actual user should be involved in the process, as it is arrogant to assume that anyone would know better than the user, what kind of design would be *perceived useful* and *easy to use*, as demanded by the Technology Acceptance Model (Venkatesh and Davis, 2000).

The agile methodologies all distribute researching, planning, implementing, testing and user input all everywhere throughout the whole design process. As in co-design, the users are involved even at the very beginning of the design, and the researchers are involved hands-on even at the end to advice the users, adjust the design and documentation, and gather new findings to improve the used theories for future cases. Testing is important, so it is done all the time. Getting things implemented is important, so it is done all the time. Planning and understanding is important, so it is done all the time. The hard core of agile methodologies consists of constantly thinking and assessing, whether the current line of action is the best way forward, and then adjusting the direction as needed. (Beck and Andres, 2004)

Agile methodologies demand constant, rigorous application of best practises in the design work. For this, the psychological theory can provide guidance towards best functional interactions in Life Before Death designs. Also the application of Design Science Research need theoretical background in the rigor cycle. Furthermore, in co-design the engineers need models to ”coach” with and do the agile design work, where also co-designing together with researchers working on the background theory, especially in the rigor cycle, will rely on this theory in the design work for Life Before Death.

Design Science Research suits well together with agile and co-design. As shown in Figure 5, the Design Science Research perceives the design work alternating between three cycles in three different modes. The central cycle is the design cycle, where the design is being concretely built. From the design cycle the process can be switched into relevance cycle, where the design is brought to the environment where it is intended to be used. There it is tested for better understanding of the concrete requirements and for testing how design features work in practise. The third cycle is the rigor cycle, where theory is, on one hand consulted for solutions for design problems and for best practises, and on the other hand built further based on the em-

pirical discoveries gained especially in the relevance cycle. The work done in study IV clearly belongs in the rigor cycle, as it consists of consulting the theory. (Hevner and Chatterjee, 2010)

From the co-design point of view, Figure 5 also shows, how the contribution of each role is focused on one of the three cycles, although still relevant in the other two. The users are most significant in the relevance cycle, the engineers in the design cycle and the researchers in the rigor cycle.

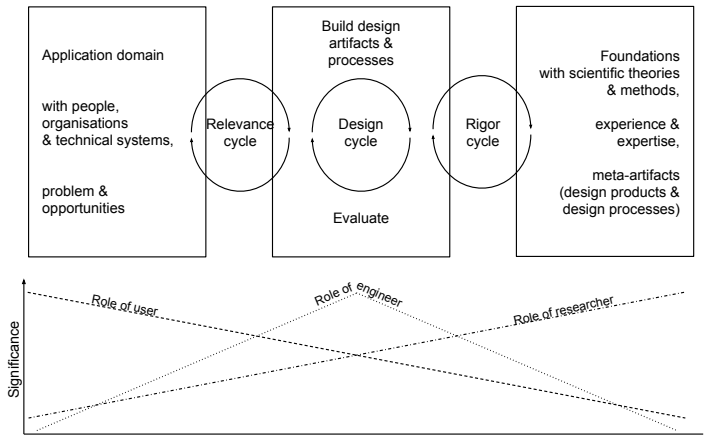


**Figure 5.** The DSR model (Hevner and Chatterjee, 2010) and the significance of each co-designer role in each design environment.

Three questions are easy to raise before designing Life Before Death: How does the facing of death affect the experienced aesthetics? How does the value of time change from the ”normal”? What kind of applications and services really are adopted into use?

Using the new theory, it could be hypothesized that based on the *expectations* category a person might value more experiences that have previously been taken for granted and thus neglected, but now may appear as valuable quality time. There may be complex interplay between the sense of *guilt* and *involvement*, where both may affect each other. A person may be more interested in feeling grounded to the reality to avoid *disbelief* and better sense *presence* right here and now.

With *expectations* of own personal future being significantly more limited than before, a person would be expected to value their time more than before. However, the expectations of how life before death will be, may also appear grim and cause a person to even aim to hasten the process to minimize their expected misery. A person may find themselves tackling to control and manage time, with being perplexed over the normal life being *interrupted* in the middle of things, the life being thus out of *control* and there appearing to be no way to properly being *involved* in their own treatment as a now central part of their life. A person may tackle to manage time

for being *present* with their loved ones and leaving a mental *heritage* of this for after their demise.

The aim of Life Before Death services, based on the theory, would be to help the person towards *serenity*, and perhaps by some means track the progress of this. This is what both Eriksson and Kübler-Ross see as the final goal of personal development (Erikson and Erikson, 1998; Kübler-Ross and Kessler, 2005). With a person's expectations fundamentally altered, and them struggling with the interruption and disbelief, the perceived usefulness of the Technology Acceptance Model will have quite particular factors to address. The prospective areas there are the person's search for control, involvement and presence.

Life Before Death is an initiative still on a very early stage with the ideas and concepts being formulated. There has been two concrete steps taken on this path at the moment. In study IV we have begun to create a single theoretical framework of the user psychology. Prior to that, as a part of early ideation, we designed an early service prototype, which was developed together with the Diaconia University of Applied sciences. However, with lack of proper funding, this prototype has since been discontinued.

With the help of this psychological theory built in study IV, a Reality Guide for Life Before Death can be co-designed using DSR and agile methodologies. Considering that in studies I and II it was concluded that game design frameworks are well applicable for the design of Reality Guides, it can be deduced towards the RQ that their practical scope even includes designing applications for matters as serious as Life Before Death.

# 5 Digital Theology

As stated before, Life Before Death is a cross-disciplinary initiative, involving computer science in other disciplines more close to humans. One natural gateway between Computer Science and Life Before Death is Digital Theology. A basic idea behind Life Before Death is that today the Internet is where people go searching for advice and guidance. In earlier times answers to such questions have been answered through religion. Religion has not disappeared. It has followed the earlier *eras of information culture* (Murray, 2012, loc 246–255) – oral, written and printed – and it is following the new era of digital information culture.

As we note in the original publication V, COVID-19 has pushed for a digital leap in education as well as in religious practises. We have been prepared by technological research on both areas, but before the COVID quarantine there hasn't been a proper reason to virtualisize the traditional practises. We have been working on the beginning of a digital theology community alongside other initiatives, such as the Global Network for Digital Theology group in Facebook.

People experience anxiety over the concept of death. Even Heidegger gives up in his investigation from trying to address the reality shift from being alive and conscious into... what? Oblivion? Afterlife? If we have never taken a ride on a rollercoaster, we can ask someone who has, and get a sense of the aesthetics throughout the experience. We can even take the ride ourselves and be transformed into a person who does know how it will feel like, if we were to take the ride again. But for actual death this is not possible. (Heidegger, 1927)

One common psychological mechanism for managing this anxiety is religious faith. Most all religions claim such knowledge of the life after death and in their positive side they try to give people a sense of safety, accompanied with prolonged capability to function during their life before death. These mechanics are studied in theology, and in conjunction in digital theology.

The span of Digital Theology beyond Life Before Death is even wider. It involves several approaches to the fascinating topics of transhumanism and artificial intelligence. (Suovuo et al., 2021)

The field of Digital Theology pushes technology upon the theologists, and theology upon the computer scientists. The younger generations of both are likely to have been sharing experiences in digital games and are easily familiar and enthusiastic over game community technologies, such as Discord. This should help the people

to ”share a common language”, for which the agile methodologies have their own mechanisms too, such as ”use case stories”.

Religions create their own realities, both within their mythos, as well as among the society following the religion. The movements of ecumenia, inclusivism, and religious pluralism all benefit from guidance of Reality Guides to these realities.

As one compares Frans Mäyrä's (2007) Contextual Game Experience Model – addressed in studies II and III – with John Falk's and Lynn Dierking's (2013) Contextual Model of Learning, one can see among the many similarities that particularly the sociocultural context is important in both experiences. The Contextual Game Experience Model considering game experiences, and the Contextual Model of Learning considering museum experiences. The same element can be seen also in the Technology Acceptance Model 2 (Venkatesh and Davis, 2000) in the properties of *subjective norm* and *image*. This provides once again evidence that game design frameworks can be useful even in Digital Theology. Awareness of the sociocultural norms are essential.

Concerning sacred architecture, ineffable space ”is a reality that [Le Corbusier] discovered” inside constructions that have reached perfection so far as to provide ”a unique human phenomenon extending beyond real time and space” Britton (2010). It may be considered pretentious to think that a Reality Guide for such a reality could, or even would need to be designed. Reality Guides aim to guide their user, and this concept of ineffable spaces appears such that in such spaces no guidance would be needed. Rather, one might consider if such spaces are already Reality Guides in themselves.

Also, in study V, we explicitly identified the Reality Guide that we used in the design work of the course. Aptly, the bulk of our Reality Guide was the Discord service, which facilitated the shared presence for the course members distributed all around the world. Thus, one result of this empirical study was that a tool designed for game play activities suited remarkably well an educational programming project activity of Digital Theology.

Finally, returning to the Technology Acceptance Model, as discussed in the Introduction, Digital Theology can provide mechanisms to improve the *image*, as well as the *subjective norm* attractiveness of services.

Digital Theology is a very new field of study, still in the phase of becoming properly established. Where modern study is still much focusing on deep specialisation within a very narrow field, another wave is rising on crossing disciplines in multi-disciplinary research and even non-disciplinary research. Digital Theology is multidisciplinary, as is the research initiative on Life Before Death. It is an excellent subject for empirical future studies regarding the RQ. On a theoretical level it would appear that applying game design frameworks in Digital Theology would be a good idea, even when not doing so in effort to gamify Digital Theology.

# 6 Life After

The conclusion towards the RQ is that it is a good idea to look into game design frameworks with the design of any interaction system. The conceptive study of Reality Guides showed that game design tools can serve them as well as pure game design. As it happens, the thanatechnology that the Life Before Death initiative is hoped to produce can clearly be seen to be a Reality Guide. As said in Chapters 1.2 and 4, the user base of the Life Before Death services exists conceptionally in another reality, so both the designers of the services need a guide to this reality, in effort to produce further Reality Guides with proper user experience in the design. Thus, it can be concluded that as the design of Reality Guides have been seen benefitting from game design tools, so would the Life Before Death design, which would refute H0. This, however, needs still to be empirically tested.

Gamification means more than just providing instant gratification through badges. Game design involves six major areas, as depicted in the GEM-model, all of which are important to the game experience. And game design is 100% *User eXperience* design. In the broadest sense, gamification means using any tools available for game development in the design of something that is, in its essence, not a game – such as a *reality guide*. More practically, it means paying attention to the user experience and the users' motivations, as in developing a psychological theory of the mindset of people at their life before death.

Studies I and II investigated different game design frameworks from an external perspective. As such, the developers of these frameworks have been focusing on improving their game design and gaining better understanding of the games they have been working on. Studies I and II explored the frameworks as tools for defining what is and what is not a game, and how these frameworks perform outside their originally designed, limited scope. The results confirmed that what works for game experience design, also works for more general user experience design.

Within these studies, the concept of Reality Guides was established. It is a tool or a framework that can serve many scientific uses. It should help in building a proper taxonomy among the variety of different types digital software. It is a helpful category for studies investigating the thresholds between games and non-games. It is a fixed point of view to the design of applications such as those expected to arise from the Life Before Death initiative – a designer should have an understanding of

what it is that they are designing, and in Life Before Death, Reality Guides are to be built.

The central substantial outcome of this thesis work is the GEM model. The fusion of Eriksson's and Kübler-Ross's theories for Life Before Death, constructed in paper III is also a significant outcome, but it cannot, by far, be considered as complete of a whole as GEM. The grounded theory on the fusion work is not yet saturated and must be still continued. This work cannot be continued without contribution from more fully fledged experts of psychology. My own doctoral studies have included a minor subject in psychology, making me aware of the reservations to be made with psychoanalytical theories, but not providing me with suitable equivalents in behaviouristic or cognitive psychology. Even with the contribution of my co-authors from the fields of philosophy and theology, the most significant role of paper IV is to function as a discussion opener. Through a longer process of grounded theory, future contributions from psychology will hopefully polish this model into a jewel similar as how I am perceiving the GEM model. As a major subject computer science game researcher I can confidently state that the GEM model describes the anatomy of game play experience, helping a designer to see, understand and improve all aspects of the design. As a result of grounded theory principles, the pleasantly symmetrical theoretical model is saturated, validating its completeness. The model cannot alone produce brilliant games, but it is very useful for improving any design towards that brilliance. User experience design still needs talent and inspiration – those cannot be synthesized, only nurtured.

Besides design work itself, GEM can help understanding the design. A game player may use it to understand better what they are looking for in games, and find such games, once they understand the anatomy of the experience and see what appeals there especially for them. A good use for the GEM model is in writing game reviews. GEM is a good systematic tool to make sure that a review considers all essential aspects of a game.

For the sake of presentation, the work done on papers I and II could be considered as concluding the results of earlier work, presenting the concept of Reality Guides as an instrument in itself, as well as an example of how the applicability of game design tools can be extended beyond just game design. The design of the GEM model in paper III is a complete synthesis of a new theory – a game design framework that through the logic of papers I and II can be extended applicable beyond game design. After the three studies, the last two studies could be described as introductions to the new questions arising from the work done, and progressing towards empirical application of these two arguments. Where this work has convened from several different directions – game research, (tele)presence, psychology, theology – it also opens up several paths to follow in the future. Life Before Death is an important initiative for future technologies, as is Digital Theology, and the design of these both can be useful to observe from the point of view of Reality Guides.

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# Original Publications

I

**Tomi ”bgt” Mäntylä, Ilmari Lahti, Harri Ketamo, Mika Luimula and Jouni Smed**

**Designing Reality Guides**

6th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES), IEEE, 2014, pages 1–8.

# Designing Reality Guides

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***Abstract*—Reality guides aim at assisting, teaching or supporting the user in the real world. Among other things they are used to illustrate history, to educate students or to provide services to visitors. In this paper, we introduce three concept applications for reality guides related to history, entertainment and education. We reflect their design to theoretical frameworks on gameness and narrativity. We also present practical considerations related to the quality of content that affect the implementation of reality guide applications.**

***Keywords—reality guides; city guides; games; storytelling; augmented reality; virtual reality; augmented virtuality***

## I. INTRODUCTION

The term 'reality guide' groups applications that aim at assisting, teaching or supporting the user in the real world. They include applications such as city guides, virtual museums or location-aware games that are nowadays commonplace. Many cities and institutes employ them, for instance, to provide service for visitors, to illustrate history or architecture, to educate students or simply to promote their possibilities.

Many reality guides are used in tourism, which is one of the biggest industries globally. According to World Travel & Tourism Council [1] tourism contributed 9 per cent of the global GDP, which means that it has a value of over US$ 6 trillion and accounts for 255 million jobs. There is already a wealth of research done on reality guides for tourist services using location information. Burigat and Chittaro [2] advocate using 3D maps in mobile guides. Nurminen [3] compares 2D and 3D city maps and observes that realistic buildings in 3D city maps are easy to recognize even in the case of certain simplifications. Partala *et al.* [4] study speed-depended camera control in 3D mobile roadmaps. Hawking *et al.* [5] report that tourism service has special needs (e.g., do-it-yourself travelling) that requires tailor-made applications.

The plan of this paper is as follows: We review the background in Section II. In Section III, we will introduce three concept applications for reality guides that we have designed and implemented. This is followed in Section IV by an introduction of theoretical frameworks on gameness and narrativity, where we reflect our applications. In Section V, we consider practicalities regarding the design and implementation of reality guides. The concluding remarks appear in Section VI.

## II. BACKGROUND

In digital reality guides, computer-generated assets relate to the physical reality. For example, a FourSquare-like city guide could give the users information about places of interest nearby based on the GPS system. It could also include a virtual reconstruction of a destroyed building or be built upon a simulation of the effects of different kinds of waste management to one's home town.

The design of a reality guide requires us to differentiate whether it is *augmented reality* (AR), where the user's physical environment is augmented with synthetic content, *virtual reality* (VR), where the user immerses in a fully synthetic environment, or *augmented virtuality* (AV), where the user's physical context affects the otherwise fully synthetic environment in which the user is immersed.

VR is the oldest of the three forms of reality guides. It does not take much to create a VR system that immerses the user. Basically, even spoken stories can be considered to be VR, if they succeed well in capturing their audiences and filling their minds with images of fictitious realities. More commonly, the early VRs have been computer games, such as *Nethack*, where the computer shows text-like characters that give the appearance of tunnel networks and creatures and objects within.

When VR becomes less fictitious and takes more and more content from the actual reality, it approaches AV. In the extreme, this means a VR in which actual people move about and interact with each other and the VR with real-world objects. As it is now, AV applications in reality guides are still rare.

Lately, AR has gained much publicity with the launching of products like Google Glass and CastAR. The emergence of digital positioning systems has enabled the devices to discover better the user's physical environment and digitally enhance it. Also, the improvements of other sensors are boosting the development of AR applications. As a technology, however, AR still suffers from many problems – both technical and artistic – that can hinder its use in reality guides. Moreover, people are actually becoming wary of Google Glass's potential of using face recognition to feed the user's information mined from the web and especially social media.

With the advent of portable devices we can recognize two trends in reality guides (for a survey, see [6]):

1. *Mobility*: The devices can be taken to any place. Moreover, we can get accurate location information to pinpoint where the user is and use that in our application.
2. *Enhanced UI*: The touch screen allows new ways of interacting with the virtual environment. Also, the gyroscope and other embedded sensors provide accurate information about the rotational state of the device.

Handheld devices are often seen as "magic lenses" which the user points and looks through to see the virtual part. There are, however, many ergonomic challenges, especially for AR [7]:

- The device has to be held at a certain distance in order to ensure that the synthetic view matches the real-world view.
- The devices have a limited field of view due to the size and resolution of the screen and the optical characteristics of the camera.
- The devices cannot provide a steady view when the user is moving, for example, just walking.

On the technical side, the *scene identification* (i.e., finding the correct location and orientation) to align the synthetic material over the real world is problematic. There are two approaches to scene identification:

- The marker-based approach requires that artificial visual tags are placed in the real world.
- Non-marker-based approach uses computer vision or geopositioning (or both).

The challenge in the marker-based approach is how to realize the marking. Even if we solve it by trying to recognize known objects from the frame (e.g., the corners of a building or a known landmark), the situation is complicated by natural phenomena like weather, time of the day, rain, snow, fog or fallen leaves. The problem of the non-marker approach is that it relies on correct positional information. Even slight differences or lag in the computation can cause visual disruptions that can break the illusion.

The artistic problem in AR is that the merging will not be seamless. Moreover, striving for physical accuracy could pose the danger of falling into an *uncanny valley*, where the effort to have a positive feedback from a synthetic entity gets too costly [8]. Uncanny valley normally refers to human-like entities (e.g., androids), but we wonder whether also in an AR application, which aims at achieving visual fidelity matching the real world, the end result might be counterproductive, and the synthetic elements could look irritatingly artificial and unnatural. This is not say that a combination of a real-world view and an augmented view in a different style cannot work, but it requires a lot from the design and limits the range of expression.

## III. Three Concept Applications

To try out and demonstrate reality guides we are developing three applications. They present different sides of reality guides, which we will use later in this paper to concretize our theoretical discussion.

### A. Lost Turku

In 1827, around 75 per cent of the city of Turku was destroyed in what turned out to be the largest fire in the history of Scandinavia. The architect-historian Panu Savolainen, a member of the development team, has combined information from sources such as old insurance documents, maps, paintings, newspapers and books to put together a detailed picture of what Turku used to look like before the fire that permanently changed the cityscape [9].

Fig. 1. Screenshot from the *Lost Turku* application showing the interior of a café.

Using this material, the team aims to recreate the lost city in virtual form. The application can act as a virtual city guide for tourists and other people interested in the history. A mobile device running the application works like a "window" that the user can turn around and look through to get a glimpse of the past (see Fig. 1). So far an initial prototype of specific indoor locations has been completed. The locations are modelled in 3D, which are accessible from a stylized 2D map. The 3D spaces are populated with hotspot items, such as newspapers, which the user can tap for additional information.

### B. *Vares*

Jussi Vares is an iconic Finnish detective, starring in dozens of noir comedy novels written by Reijo Mäki. Many of the novels have also been made into movies – so far eight and the filming of the next six movies will commence in 2014. Most of the Vares stories take place in the city of Turku, the detective's hometown. These two reasons together motivated the development of an application dedicated to Vares, as it could act as a marketing boost for both the upcoming movies as well as the city itself.

The first prototype was made as an indoor geocaching application, which was demonstrated in the Turku International Book Fair. The most important result was that the use of visual markers is still challenging. Just around 50 visitors out of around 22,000 visitors were able to complete the game and return back. Therefore, in the current implementation visual markers are not included (they are optional). The application is based around an interactive, GPS-enabled, thematically stylized map of Turku. There are hotspots on the map marking locations frequented by Vares. Through these hotspots, the user can access Vares media relevant to the location, such as video and text as well as 3D and other game content. Game content can be anything from 3D visuals to quizzes and treasure hunts. The idea is to motivate the users to tour Turku more in-depth than they would without the application.

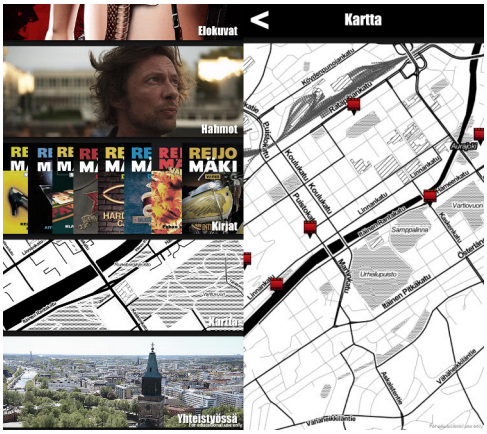


Fig. 2. Screenshot from the prototype of the *Vares* application.

A prototype of the application has been completed (see Fig. 2), and is undergoing thorough testing. Feedback from this phase will dictate its further development.

### C. *Mapping Energy*

The concept of sustainable energy production is complex: not only how energy is produced but also how it is transmitted into the place of consumption, how it is used and why it is used. *Mapping Energy* is an educational game for a location-aware massive open online course (MOOC) for first-year and aspiring engineer students. The game focuses on energy production, transmission and consumption.

Location awareness is at the core of the game mechanics, because all content is connected to a geographical location. The players can label all the content (e.g., energy production, transmission, consumption, and waste management points). Location awareness has many benefits. In an everyday environment, the students may find it easier to approach the relatively abstract concept of energy. Moreover, the students need outdoor exercise to balance working hours inside.

The idea in the game is that all the students search for energy use in their environment and describe it with pre-defined tags and free text. After searching and labelling the players have to evaluate other players' activities. The more labels the player has made and the better the crowdsourced evaluations are, the better the player's score. The act of evaluating also affects the player's score, because everything is crowdsourced and normalized. The idea behind crowdsourcing everything from the very beginning is that it enables us to build a scalable learning solution.

## IV. Theoretical Frameworks

There are several studies to analyze, categorize and theorize game player experience [10]. The frameworks generated by these studies are easiest to use to analyze the appeal of existing games. Can these frameworks be used as synthesizers to assist building a good game with appealing user experience? We are attempting to shift the use of these frameworks from the Bloom's Taxonomy level of *evaluation* to *synthesis*, which is, as Johnson and Fuller [11] suggested, not a way to an easier process.

To make our applications the best possible, we need to understand, what we are building. To analyze the essence of our application concepts we have chosen to use two theoretical frameworks. We use the frameworks to synthesize the best possible application design. There is certainly a level of playfulness in our applications, and they all also each have their stories to tell. For this reason, we will next look more closely on the *gameness* and *narrativity* and how it applies to reality guides.

### A. *Gameness*

Our first framework is a fusion of two game theoretical frameworks that both are concerned over immersion. Immersion refers to users' detachment from their real-world surroundings and their concentrated attention upon a synthetic world. Immersion is not necessarily due to audiovisual input, but meaningful action and possibility to choose also play an important role in creating it [12]. Moreover, immersion is not a

single phenomenon. For example, Adams [13] finds it as three different phenomena produced under different circumstances:

1. *tactical immersion* created by high-speed action,
2. *strategic immersion* created by concentrating on the situation, and
3. *narrative immersion* created by the narrative.

Ermi and Mäyrä [14] find immersion as another three different phenomena:

1. *sensory immersion* created by human sensory stimulation,
2. *action based immersion* created by concentrating on taking action, and
3. *mental immersion* created by the narrative.

In reality guides, we can apply from Adams' classification items 2 and 3. From Ermi and Mäyrä's classification items 1 and 3 apply, as well as item 2 to some extent, if we consider it as the ease-of-use. Were one to argue that reality guides are not games, it could be pointed out that immersion in reality guides is based on sensory, strategic and narrative immersion, as it is with games, but not on low tactical or action based challenge. The SCI model of Ermi and Mäyrä, however, defines the structure of a game to have *rules*, *story* and *space*. For example, in *Donkey Kong* the rules involve climbing up the platforms, dodging rolling barrels and reaching the top level; the story is that Donkey Kong has captured the princess and Mario has to rescue her; the space is a screen containing platforms and ladders. (In reality guides, the *space* typically relates to the real world.) When we analyze the gameness of our applications, we will also use these three elements.

Our fusion of these two game play frameworks for our purpose is:

1. *sensory immersion*, which is high when the player is convinced by the realism of the virtual assets;
2. *negative action based immersion* which is high, when the player has as little as possible hindrances in interacting with the virtual;
3. *strategic immersion* which is high, when the player is concentrating in the current situation; and
4. *narrative immersion* which is created by the narrative.

Hagen interviewed six game developers on how they design for player experience [10]. He discovered that this is primarily done through *autobiographical design*, where the designer(s) try to formulate a feeling or an image of the user experience they wish to create and then use that as a way pointer. The interview clips in Hagen's paper do not appear to be in conflict with our game play framework. One could consider that these four dimensions could serve as a good set of perspectives from where to try to cover the whole of the field of user immersion in a systematic, objective fashion like of which Hagen was looking after in his study.

Evaluation of the service concept based on Ermi and Mäyrä's SCI model [14] is also included in Mäyrä's Contextual Game Experience Model (CGEM) [15]. The CGEM shifts the focus towards the contexts surrounding a player, and is thus not easily used to synthesize a good design. We have little control, or even information on the targeted audience's *immediate personal context*, *intermediate social context*, or *context provided by the earlier forms for game and play*. We could draw from the *context for digital game's production*, and somewhat from the *contexts provided by the earlier forms for game and play*. Especially we can assume that people interested in the *Vares* application have seen the Vares movies or read the books. However, the prospects here appear low.

*1) Lost Turku*

The goal for *Lost Turku* application as a user experience is to help the user in getting an understanding, and perhaps even a feeling of how Turku has been two hundred years ago, before the Great Fire. The game is very low on *rules*. One can basically just stand and look around. Only the social media connectivity can bring social rules in the game, but even that is rather closer to the *story* (we will discuss this more detail in the subsection on Narrativity). The *space* is limited to just one spot, but the greatest effort is to be placed there, as this application as a game is really nothing much more than the *space*. We want this application to have social media connectivity, especially to Twitter, but we have to consider how not to have Twitter to cause strain to the space and story. Cyber bullies could end up filling the application with unsolicited mass advertising. Depending on whether this application is used on-site or off-site, it is either AR, or VR.

We hope the story and space of the game to facilitate for a high *narrative immersion* to support learning of history. The *narrative immersion* is to be supported by high *sensory immersion* and *negative action based immersion*. The users should not have to strain themselves in using the application to see the virtual scenery properly overlapped over the real scenery. Problems in the *strategic immersion* may either hinder or support the *narrative immersion*, so it should be considered carefully, or kept low.

*2) Vares*

The goal for the *Vares* application is to present the city of Turku as a real location of the fictitious events of the Vares detective stories. The target audience of this application is expected to be familiar with the books or the movies. The *space* of the game is the real physical Turku, if you use the application so that you walk around the city and activate hotspots whenever you arrive at them. In this case, the application is AR. Should you use the application so that you look at the in-built map and you tap on the hotspots there, it is elementarily VR. However, the map is based on the actual Turku and the hotspots provide with video material from the actual place, so it has also taken a step towards AV. The *rules* of the game are as in *Lost Turku* – not many, if any. You can either travel on-site or tap on the hotspot map. The *story* of the application fuses with the Vares stories (for more details, see the subsection on Narrativity).

We are aiming at high *narrative immersion*, to the virtual reality of the Vares stories augmented by the real Turku. The application as such will not be boasting with high fidelity

sensory experiences. There will be text captions and movie clips. The *sensory immersion* is drawn from the physical reality of the actual Turku, where the users are hoped to visit with the application. As with the previous concept, the *negative action based immersion* is essential. Being based on established stories, the *Vares* application could exploit a high *strategic immersion*, for example, by enabling the user to discover interesting stories by choosing which locations to visit and in which order.

*3) Mapping Energy*

The goal for *Mapping Energy* is to make the players better aware of the life cycle of energy from its sources, through the means of harnessing and distributing it, to its use and finally even reuse through recycling. The *space* of this game is the real physical world and it cannot really be used off-site, so it is an AR guide. The *rules* are a few: Be on a site and either label it with predetermined tags and free text, or give another player's created label a rating. The winner is determined by the amount and received ratings of the created labels. The *story* of the game is created by the labels. Fundamentally it tells where energy comes from and what eventually happens to it.

We hope the story and space of the game to facilitate for a high imaginative immersion to support learning of history. The *sensory immersion* can be very low on the virtual part of the game, which would help to facilitate a high *negative action based immersion*. Of course, with the low sensory immersion to the application, the user is not taken away from the physical reality, from which creates challenges to the *narrative immersion*. The main focus of this application lies on high *strategic immersion*.

## B. Narrativity

In the oral tradition of storytelling, a bard would adapt the story depending on the audience – even the structure of the story could vary within certain confines [16]. Only with the advent of the written media storytelling "petrified" and became to mean the process of an author crafting a reproducible composition. Instead, *interactive storytelling* has taken the original meaning emphasizing the reactive and performative aspects of storytelling. People engage in interactive storytelling, for example, in (live action) role-playing games, improvisational theatre, tour guiding, and teaching [17]. For instance, a tour guide visiting the same location might tell different stories depending on whether the tour group consists of schoolchildren or pensioners and on the group's questions and reactions. Similarly, a good teacher can adapt a lesson according to the feedback from the class.

To understand the difference between storytelling and games we can separate the content into two groups: kernel and satellite [18]. The term *kernel* refers to the essential content of the story or game that is repeated when it is experienced anew. Basically, the kernels form the identity of the story: If we change a kernel, we will end up having a different story. In comparison, *satellite* refers to content that could be omitted or altered without changing the story. Within this framework the reader or player could have three kinds of influence: no, limited or full (see Table I):

- If the user has no influence on the kernels and the satellites, we have a linear story (e.g., a novel or a film).
- If the user has no influence on the kernels but can influence the satellites, we have a linear game (e.g., *Half-Life*).
- If the user can choose the kernels from a set of alternatives but has no influence on the satellites, we have a non-linear story (e.g., hyperfiction).
- If the user can choose the kernels from a set of alternative and can influence the satellites, we have a quest game (e.g., *Star Wars: Knights of the Old Republic*)
- If the user can influence both the kernels and the satellite, we have a (pure) game (e.g., chess)

TABLE I. USING KERNELS AND SATELLITES TO DIFFERENTIATE STORIES AND GAMES [18]

| **Kernel influence** | **Satellite influence** | |
|---|---|---|
| | ***Not possible*** | ***Possible*** |
| ***No influence*** | Linear story | Linear game |
| ***Choose from alternatives*** | Non-linear story | Quest game |
| ***Full influence*** | N/A | Pure game |

Storytelling and narrative immersion is important factor in reality guides. Reflecting to human tourist guides, they often engage in storytelling when explaining the history and guiding the groups. Therefore, we aim at including narrative elements in our applications:

*1) Lost Turku*

The historical facts and events form the set of kernels, where the users can choose the ones that interest them. For example, the users could decide to follow what happens to a student, which would take them to the student's lodgings, to a café, and to a lecture. Within these spaces the users have freedom to examine the surroundings and find out more about the student's life – his background, studies and pastime. This forms the users' satellite influence. With respect to the classification of Table I, *Lost Turku* is a quest game, where the users' "quest" is to learn more about the early 19th history through personal histories.

*2) Vares*

The fictional world of the detective Jussi Vares forms the set of kernels, where the users can select the ones that interest them. The user is reminded of scenes in the original stories and this fuses into the story of the user traversing from a hotspot to another. There is a wealth of material existing from the novels and films, which makes the kernels familiar to the users. However, within a kernel the users' satellite influence is very limited (or non-existent), and users experience or re-experience scenes from the Vares movies and novels. In the classification of Table I, *Vares* application is a non-linear story.

*3) Mapping Energy*

In comparison to the previous applications, the story of *Mapping Energy* is the most abstract: energy consumption. The users have a full influence on both kernels and satellites, which makes it a pure game in the classification of Table I.

## V. Quality of the Content

The theoretical frameworks give us a basis for the design of reality guides but there is a need for more practical considerations. Here, our focus is on the actual content of the application: its assets (e.g., graphics, animation and audio) and its connections to the social media. Both provide the user a surface to the application: they are the first things that the user experiences, which is why they have to be well designed.

### *A. Creating the Assets*

A common complaint about reality guides is that their outlook is too sterile without the liveliness of real world. For this reason, they could include more aesthetic elements such as plants, animals, seasons, times of the day, articulated human beings. What makes the content life-like comprises many small details:

1. *Wear-and-tear*: Instead of polished and almost too perfect appearance the world should include worn-out and used objects. Here, commercial computer games provide good examples on how to set the mood using textures and graphic shaders to create more realistic appearance.
2. *Time of the day and seasons*: Timewise the reality guide applications normally are fixed to summer and daytime. However, modern game engines provide parameterized settings to alter the scene to different times and seasons.
3. *Flora and fauna*: Apart from man-made objects, trees are the most typical visual decoration. Adding animals and vegetation, however, can greatly change the mood of the scene.
4. *Human actors*: Ideally the scene should include fully-articulated human beings controlled by computer or other users. Realizing this is demanding and requires extra resources.

Having listed the contentual issues, we can prioritise our needs and possibilities. Adding (1) is easy and requires little work, and also (2) is provided by the underlying game engine. Regarding to (3), vegetation requires rendering but does not require animation, which makes easy to include. Animals, however, need animation and control-logic, but we can limit to animals whose movement and behaviour are easy to model (e.g., flying birds using flocking algorithms). The highest requirements come from the fully animated animals and human beings.

### *B. Exploiting Social Media*

The primary platform for our concept applications is mobile devices. Mobile devices share great synergy with social media. For example Facebook and Twitter are natively supported by Apple iOS.

There are three possibilities to apply social media in mobile applications:

1. the application can internally support sending updates to the social media,
2. the application may search content from social media, for example search for hashtagged entries in Twitter, or
3. the application itself may be a form of social media.

The case with the *Mapping Energy* application is clearly of the 3rd kind. The application is used by several people with identities within the application, and they create content in the system for each other and discuss it within the system. Still, it might be worthy looking into the 1st kind of application as well. It could have a good impact on a student, if their friends would tweet their best quotes from the application, or post them as Facebook status updates.

With the *Vares* application, only really the 1st kind of use of social media would be useful. The application clearly is not itself a social media application, and the story focuses rather clearly around the original Vares stories, that getting input from other users would probably just break the immersion. However, people who travel from out of town to see the actual locations, might very well love to tweet or update their status with the application confirming them being on location. This would serve the people's motivation to tell stories, jokes and communicate their presence, as recognized by Jacucci *et al.* [19].

The story in *Lost Turku* is original and open enough to possibly benefit from user-created content. It would be interesting to try using a dedicated Twitter hashtag for the application to support the 1st and especially the 2nd kind of social media use. One idea for such is to have these tweets appear as speech bubbles over animated characters on the view. A challenge is, how can we make the readers understand that the texts are written by real people? How can we make the writers understand that they are writing to real people, so that they would be rather keen on coming to meet them, rather than misbehaving and thereafter cyber bullying?

Although the designer of a synthetic world has a large impact on its formation, the human users finally shape the synthetic world [12]. By making the rule stricter and more formal, the designer can encourage certain behaviour patterns to emerge but this control is by no means complete. Instead, the users themselves form institutions (i.e., commonly followed behavioural patterns) by communicating and interacting with one another.

Considering recent cases of abuse in public social media campaigns [20] however, moderation would be required. The feed into the application should probably not be direct, but there should be a server storing the tweets, so that certain tweets can be erased from appearing, if needed. The server would also be useful, where Twitter actually does not excel in storing and searching of very old tweets.

According to the analysis by Stenros *et al.* [21] about acceptable use of social media should be well integrable to our service. We do not intend to generate purely automatic content

from the service to flood social media services, which would be looked down upon. Instead, users may post their "feelings, thoughts and mindsets" using a tag or short link to denote that the update was done through the application. This would also serve as a good crowd sourced marketing of the applications.

In addition to the narrative aspects, we need to consider the effects to immersion as considered in Section IV. Already Fleck *et al.* [22] had a preliminary study of a museum without augmenting technology. Out of the study they "took away […] a constraint, an observation, and a question. The constraint was that explorative play and discussion among visitors are key characteristics of the [museum] and that [their] tools should not interfere with them. The observation was that information has a role, but, for many visitors, the information on the labels was secondary to the experience. The question was, could [they] improve access to information without breaking [their] constraint." In our case, the museum *is* the information. We are aided by the fact that the experience in itself is to immerse into the augmenting service, and also the social aspect is partially from the device. The risk we have is that the social media connection may interfere with the explorative play of looking at the scenery and with the discussion among the group of visitors who are physically present together.

We need to make the interface for using the social media as fluent as possible, in order not to decrease the *negative action based immersion*. Towards this end, we should apply common practices to which the users are already used to. An example of a good social media interface might be in the Vimeo iPad application. The application itself is a video sharing tool. The video playing display has a modest sharing icon on the top right corner of the screen (see Fig. 3). As the user taps this icon, the video is paused and a menu opens at the bottom of the view to allow user to interface with the available social media tools.

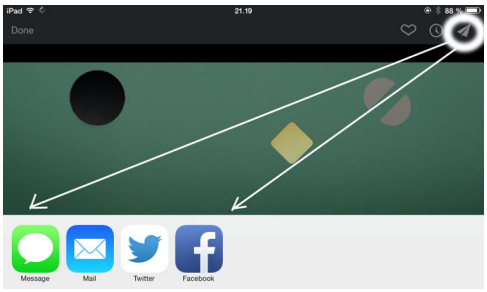


Fig. 3. Sharing in Vimeo: The sharing icon is surrounded with a white circle and the arrows show the open menu

## VI. Conclusions and Future Work

In this paper, we have introduced three concept applications for reality guides that we have designed and implemented. These reality guides open new business opportunities especially in tourism. This field have already been studied for years. We have seen that technology still set some limitations. On the other hand, mobile devices are already nowadays equipped with gyroscopes and efficient processors, which will open new possibilities for application development. One of the main challenges in this development is to set up working groups multidisciplinary research competences (such as architect-historians or film producers).

We have presented how to use theoretical game and narrative frameworks to synthesize design guidelines for reality guide applications. Reality guides presented here have only a few *rules*. Their *space* consists of the real world, or at least a part of it. They could possibly each enrich their *story* with social media. This assumption is consistent with the discovery that the narrative of the application concepts is giving the user at least some influence on the kernel too. The immersion is provided highly through *narrative immersion* and *negative action based immersion*. *Sensory* and *strategic immersion* may vary.

We now have to produce these applications using the guidelines and to evaluate the outcome. A user study is needed to test, how immersion succeeds and if the user experiences match our intentions. Future work also includes conducting user experiments to study the effect of different kinds of immersion. We want to examine the *uncanny valley* effect in reality guides, especially with non-human-like entities. We want to also examine the usability of social media as a source of content for reality guides.

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# Game Design Frameworks and Reality Guides

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II

# Handbook of Research on Gaming Trends in P–12 Education

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# Chapter 4
# Game Design Frameworks and Reality Guides

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## ABSTRACT

*The gamification trend has cultivated a wide variety of game design frameworks. In this chapter, we use the concept of reality guides to analyse the characteristics of a few of these. Reality guides are applications that aim at assisting the user in the real world. As such they are not games, which is why we can use them to investigate the applicability of game design frameworks in a wider context than they are originally introduced for. Although these frameworks are for games, we find them at least partially applicable in the design of any kind of software and services. We also further refine the concept of reality guides as a type of application and consider the apparent usefulness of these frameworks on them.*

## INTRODUCTION

The term 'reality guide' (RG) groups applications that aim at assisting, teaching or supporting the user in the real world. Among other things they are used to illustrate history, to educate students or to provide services to visitors. They include applications such as city guides, virtual museums or location-aware games that are nowadays commonplace. Many cities and institutes employ them, for instance, to provide service for visitors, to illustrate history or architecture or simply to promote their possibilities. RGs are, therefore, enhanced replacements of the traditional paper printed guides.

RGs can be one-directional guides to, for example, a museum where the visitors are given information about the exhibition as they arrive at different locations, but where they cannot give their own input. Alternatively, RGs can be bi-directional social media applications where people share reviews of locations where they visit and

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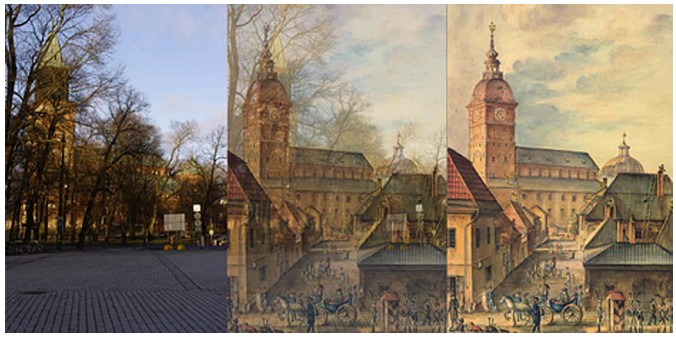
can find the reviews of others. There are different approaches to RGs: some of them are games, while others are more like social media applications. Also, they are often applying augmented reality (or augmented virtuality) – in one way or another – to transmit information. Some well-known examples of RGs are *FourSquare*, *Paris3DSaga*, *Ingress*, *Geocaching*, *Google Maps*, and – to some extent – Wikipedia. Our project *Lost Turku* (Mäntylä, Lahti, Ketamo, Luimula, & Smed, 2014), which is currently a virtually reality of a reconstructed real location 200 years from history, is a one-directional guide that uses a student's story as a narrative (see Figure 1). *Vares* (Mäntylä et al., 2014) is another of our RG applications. It guides people to visit various locations in Turku where the fictitious events of the Vares detective books and filmatisations are placed. The application reminds the user of scenes in the original stories and movies and fuses them into the story of the user traversing from a hotspot to another.

Our motivation in this article is to look into different frameworks for understanding games, RGs and narratives: What they are, what they are not, and what distinguishes them from each other. The field of game research has seen new terms, such as gamification and serious games, which are basically already established. However, there is still work to be done to make clear distinctions in terminology, as the word "game" itself already has several meanings, ranging from hunted animals to even acting in a live-action roleplaying game. The success of Foursquare has been an elementary part of sparking out several different innovative categories of applications, including RGs and gamification, for example. (Detering, Dixon, Khaled & Nacke, 2011) This new field is very young and we are joining the effort with Detering et al. to help keeping sense and order in the terminology.

For game designers, children and youngsters form a challenging audience. Rogers (2014, pp. 35–36) makes the practical observation that children usually want what is made for an audience older than their own age group. This is often due to the game developers' tendency to oversimplify and talk down to younger audience. This observation is accompanied by Burgun (2013, p. 57) who emphasizes that although children's games might not do a lot, what they do they should do with elegance as it is of utmost importance with children. Game designers have found ways use stealth learning, which inspires players to learn without being aware that they are being taught

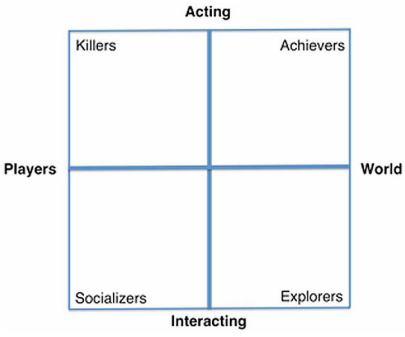
*Figure 1. Augmentation of the current real Turku Cathedral area with an image from the history in the Lost Turku reality guide*



(Adams, 2014, p. 27). The benefits of gaming in learning include increased memory, class performance, social benefits and improving the transfer of learning (Sharp, 2012). According to Crawford (1984) games are "most ancient and time-honored vehicle for education", which make them natural tool for teaching pupils, especially when they are unaware or uninterested in learning.

In this paper, we tackle RGs from various directions based on relevant literature. We begin by looking at RGs from the human user's point-of-view: We consider Bartle's player taxonomy, Octalysis, Myers-Briggs and Keirsey, DGD and Brainhex, and Radoff's FUNdamentals. After that, we approach RGs from the direction of game design by evaluating Schell's game design lenses, after which we apply contextual game experience model to RGs. Then we consider RGs with respect to the environment using Benford's classification of shared spaces and Ermi's and Mäyrä's contextual game experience model. Our last approach is narrativity, where we review models by Aarseth, Murray and Aylett. After that, we will discuss other possible approaches and the implications of our work.

*Figure 2. Bartle's four player types*




## BARTLES'S TAXONOMY

Based on his observations on multi-user dungeons (MUDs) Richard Bartle (1996) presented a taxonomy of different player types, which divides the players into four groups according to their activities (see Figure 2):

1. **Achievers:** People who set themselves game-related goals that they then try achieve.
2. **Explorers:** People who try find out what is in the game world and map it for others.
3. **Socialisers:** People who want to converse and interact with the other players.
4. **Killers:** People who use the game to dominate to other people.

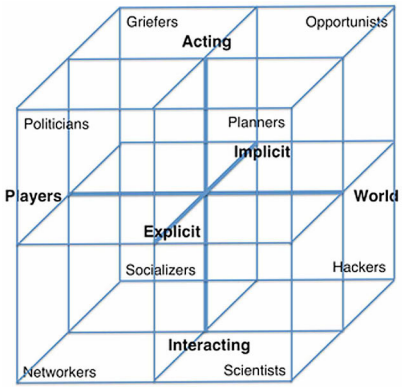
The player's motivations should be understood as a mix of these, and the type of play for a single player can change during gameplay. For example, in the early game the player can act more like an explorer, whereas towards the end he can turn out to play more like a killer.

Andrzej Marczewski (2013) gives another perspective into these four player types. He adds one dimension to the chart, based on the user's motivations being intrinsic (self-rewarding) or extrinsic (expecting an external reward); see Table 1. Marczewski's killers are either philanthropists, who "seek a sense of purpose from a system", for example, by "answering questions on Quora", or self seekers, who "seek rewards from acting on others", for example, by "answering peoples questions just for points". Marczewski sees that "self seekers have no real interest in the people within

*Table 1. Marczewski's player types*

| | Intrinsic | Extrinsic |
|---|---|---|
| **Killer** | Philanthropist | Self Seeker |
| **Achiever** | Achiever | Consumer |
| **Explorer** | Free Spirit | Exploiter |
| **Socializer** | Socializer | Networker |

*Figure 3. Bartle's eight player types*




a system, they are just a means to an end", and "philanthropists are the parent figure. They are the ones who are likely to want to help anybody they can, no matter of the other person's motives".

Bartle (2005) also expands his taxonomy from four to eight player types by adding a new axis: implicit (spontaneous behaviour) and explicit (premeditated behaviour); see Figure 3.

The proper application of Bartle's model is somewhat unclear. Edvard Castronova (2005) uses Bartle's four-type model to examine "synthetic worlds". He looks at the games through users. He considers who would be an *achiever*, *explorer*, *socialiser*, or *controller* in a game and what kind of game they would best enjoy. Bartle (2005) proposes that users advance through certain typical *development paths* within the game, starting most typically as *griefers*, developing to *scientist* to *planner* to *friend* as they come more and more familiar with the game. This would suggest that a player has individual player types for each game. Bartle looks at the users through the game.

Bartle's player type model seems to excel as a lens-like design tool, such as Radoff's FUNdamentals and Schell's lenses that we will discuss further later in this chapter. These tools help the designer by giving different angles to look at the design. We have not found yet, however, why precisely eight different categories would suffice to cover all the necessary aspects of human behaviour. We believe that we would benefit, on the field of game studies, from the input that the researchers of psychology could give to the models.

It would be interesting to make a similar study on RG users as Bartle has done on MUD players, and discover the relevant axes there. Bartle's methodology is based on his wide experience on the MUD players, both personal and from his fellow players. This methodology is difficult to apply on single-player games and one-directional RGs as they have no other users to observe and report on the user's behaviour. Also, we do not currently enjoy the deep insight of a strong experience on user behaviour in RGs as Bartle does in MUDs. What we can do is to apply Castronova's method to the player types and consider how different personalities would find RGs.

*Opportunists* in games take every opportunity they see without bothering with tackling obstacles or spending lots of time with any single feature. This behaviour is easily perceivable for an RG user as well. Also the explicit *achiever* type, *planner* would act the same in RGs as in games – set themselves goals and persistently pursue their way towards them.

*Scientists* in games experiment with the game mechanics to find out and explain how they work. This behaviour is world-oriented and therefore directly transferable to any RGs as well. The same applies with the explicit *explorer* type, the *hacker*, who seeks to discover new phenomena and experiment to reveal meaning.

*Networkers* in games search for interesting and worthwhile people to interact and want to get to know their fellow players. If the RG is bi-directional, they can demonstrate such behaviour there as well, but it is not clear how they would consider one-directional RGs, especially if there are not even proper computer controlled characters

to interact with. The implicit *socializer* type, the *friends*, who enjoy a familiar company of other players they know well, suffer the same problem. A networker might not play single player games at all, but unlike for games, for RGs the purpose of use is usually not the application in itself, but the reality it gives guidance to. Hence, one might assume that lack of social interactions in an RG would cause discomfort in the networker type of users and that these users would probably try to apply social interaction in the use of the RG anyways, for example by posting screenshots or text captions in social media.

*Griefers* in games attack other players to get a big, bad reputation. Such behaviour is demonstrable in bi-directional RGs as well. Bartle does not clearly point that griefers would attack the game system (e.g., the application and servers) as well as other players. Attacking the system would be some kind of mix of a griefer and hacker or scientist. One might assume that in one-directional RGs a griefer would be interested in causing problems in the application big enough to be recognized by people. They might, for example, spread story spoilers that would ruin the suspense of the story of the application from other users. The explicit *killer* type, the *politicians* aim for a big, good reputation in games. This behaviour might be demonstrated with one-directional RGs through writing insightful reviews and helpful hints on personal blogs, again outside the actual application.

To consider Bartle's *development paths* in one-directional RGs, we should take the *world*-oriented one, as in one-directional RGs the user cannot act player oriented. This development path in Bartle's theory progresses from *opportunist* to *scientist* to *planner* to *hacker*. The initial player type would be *opportunist*, who goes through every easily available feature in the application to discover the first glance and the easy pickings of the system. Then the user would start to experiment with the system more methodologically, being *scientists* who try to understand its workings. They would then have formed some kind of idea of the system's possibilities and set themselves goals that they pursue as *planners*. Finally, they would have found the application as a casual part of their lives, or mostly abandon it, only finding interest in the system when they come up with some exotic idea they want to try in the system, which they now master perfectly as *hackers*.

*Figure 4. The core drives of Octalysis*


## OCTALYSIS

Not all type profiling on games is done on the players. A recent taxonomy by Yu-kai Chou (2013), called Octalysis, is used to profile a game rather than the player. Octalysis consists of eight "Core Drives of Gamification" – Meaning, Accomplishment, Ownership, Scarcity, Avoidance, Unpredictability, Social Pressure and Empowerment – which Chou identifies as things that motivate people and tries to map how well a gamified system meets these eight core drives (see Figure 4).

More specifically, the eight core drives are:

1. **Epic Meaning and Calling:** Players believe that they are something greater or they were "chosen" to do something. This core drive makes the users, for example, to devote much time to create things for the community (e.g., writing to Wikipedia or participating in Open Source Projects).
2. **Development and Accomplishment:** This is the internal drive pushing the players to make progress, develop skills and overcome challenges. It is the easiest core drive to tap into in game design (e.g., with points, badges, or leaderboards).
3. **Empowerment of Creativity and Feedback:** Players are engaged in a creative process where they continuosly have to figure out things and try different combinations. This core drive reflects the need to see the results of creativity, to receive feedback, and to respond in turn.
4. **Ownership and Possession:** When players feel ownership, they want to make what they own better and own even more (e.g., virtual goods, virtual currencies or customizations for avatars).
5. **Social Influence and Relatedness:** This core drive reflects the social elements driving people (e.g., companionship, competition or mentorship).
6. **Scarcity and Impatience:** When players cannot have it now, they will keep thinking about it, which is the focus of this core drive.
7. **Unpredictability and Curiosity:** This core drive represents the want to find out what happens next, which is, for example, the drive behind reading stories.
8. **Loss and Avoidance:** This core drive steers players to avoid something negative from happening.

According Chou (2013) the core drives on right-hand side of Figure 4 – related to creativity, self-expression and social aspects – represent intrinsic motivations, whereas the core drives on left-hand side – related to logic, calculation and ownership – represent extrinsic motivations. Moreover, the core drives on the top (which Chou calls "white hat") are positive motivations, and the core drives on bottom ("black hat") reflect to negative motivations. Black hat drives appeal to the players, but do not make them feel good – and one could argue that they are alike to an addiction. White hat drives make people feel good and attract them to return to the game to create something more rather than seek for thrills.

Chou himself has made an Octalysis analysis for web services that are not actually games such as Facebook and Twitter. This suggests that the tool is really not specifically a game design tool, but a tool to analyse the attractiveness factors of RGs or any application. Epic meaning and calling, as well as scarcity and impatience might first appear as something that dedicate the framework for games, as one hardly considers a word processor, for example, as having an epic meaning, or would appreciate scarcity or impatience there. However, a word processor would be likely to gain popularity, if it managed to give the feeling of epic outcomes for important documents for the user, and, indeed, Microsoft Word is more succesfull in easily including great looking styles to a document in real-time during editing, unlike for example LaTeX. Although, LaTeX appeals to many users in its professionality, which makes use of the same epic meaning and calling – to be cool and epic by using something that is "a professional tool, rather than a shiny play thing" as some LaTeX fans might describe Word. Scarcity and impatience motivations can be also appealed by providing style libraries and functionalities that are attractive and not available in other products.

The Level 2 of Octalysis tries to better approach gamification, by describing a matrix of Level 1 Octalyses. One dimension here is the Bartle's Taxonomy, already discussed earlier. The other dimension contains discovery, onboarding, scaffolding and endgame phases. This Level 2 does not add anything fundamentally more to the framework. Only difference to Level 1 is that the signifigance of the drives vary depending on the player's point of view in aims and time with the application.

## MYERS-BRIGGS, KEIRSEY, AND THE BIG FIVE

Bartle's and Chou's taxonomies both are tools for psychological profiling, However, neither have a background in psychology. They are both experts in games and have created their taxonomies based on their personal experiences. Next, we take a look at two strands on theories of personality. One strand includes the popular Myers-Briggs Type Indicator (MBTI) (Myers & Myers 1980) and the Keirsey Temperament Sorter (KTS) based on David Keirsey's critique on the MBTI (Keirsey 1998). These two are popular among consultants of various sorts, but heavily criticized by personality researchers. The other strand includes personality trait theories that, opposite to the former strand, enjoy a wide support of the contemporary psychologists. The most popular of the trait theories is the Five Factor Model – also known as the Big Five (McCrae & John 1992). In the upcoming sections we compare these to the game player taxonomies.

After World War II, Isabel Myers and Kathrun Briggs devised the MBTI questionnaire for identifying different types of personalities based on Carl Jung's Psychological Types. Later David Keirsey criticized the work and published a questionnaire of his own, the KTS. Based on Jung's theory of psychological types, they both consider four fundamental personality types that are each further divided into four subtypes, totaling in sixteen types.

These sixteen types are denoted with four-letter combinations such as ESTP. According to Myers-Briggs, the first letter is E for extraverted or I for introverted; the second letter is S for sensory or N for intuitive; the third letter is T for thinking or F for feeling; and the fourth letter is J for judging and P for perceiving.

The main difference in MBTI and KTS is the hierarchy of the 16 types. Myers focused on perception and judgement, partitioning the 16 types into four groups: the *sensing plus thinking* ST, the *sensing plus feeling* SF, the *intuitive plus feeling* NF, and the *intuitive plus thinking* NT. The extravertion-introvertion and the perveiving-judging preferences were considered only to further modify these four main personality types. Keirsey disagreed on this finding that the subtypes in ST had very little in common, as well as the subtypes in SF. However, he found it more feasible to first partition the types on the intuitive-sensing preferences and then, further partition the intuitive types on the judging-feeling preferences, but the sensing types on the perceiving-judging preferences. His four main groups were: the *sensing plus perceiving* SP, the *sensing plus judging* SJ, the *intuitive plus feeling* NF, and the *intuitive plus thinking* NT. (Keirsey 1998)

These personality assessment tools predate the game player type taxonomies. They are invented by "consulting psychologists" and therefore the focus of their creators has been in the practical usability.

The scientific study of personality accuses the MBTI and KTS of lack of empirical evidence. The trait theories originate from 1930's and are being built with rigorous scientific rigor. However, even the most popular of them, the Five Factor Model (also known as the Big Five) is not as commonly applied in practice as MBTI and KTS, although, for example, Jason VandenBerghe (2012) has promoted its use for game designers to understand players' behaviour.

## DGD AND BrainHex

Chris Bateman and Richard Boon (2005) devised the Demographic Game Design model (DGD1), which is an adaptation of the Myers-Briggs typology to games. This work has continued as an empiric survey study that resulted in a further version, DGD1.5, which took distance from the Myers-Briggs typology. Later on, the DGD2 by Berens was again transformable to the Myers-Briggs. Nacke and Bateman have later on focused more on neuropsychology in their work and the currently worked on typology survey, BrainHex, has discarded the Myers-Briggs model altogether and is based on more recent theories in psychology. (Bateman, Lowenhaupt & Nacke, 2011)

The game research field contains models that are based on psychological theories as well as models that are based on personal experiences. Scientifically the most solid models would be the fusions of the two, where theoretical understanding of psychology is combined with empirical studies on games. One example of such is the fresh BrainHex player satisfaction model (Nacke, Bateman & Mandryk, 2011), which applies neuropsychological studies among others in effort to understand the reasons behind the models.

At the least, player typing helps the game designer to look their design from multiple perspectives. We dare say that even if a player type system is not a perfect model of the human psyche, a good model will, nevertheless, help the game designer even to better understand different kinds of players and significantly improve the game experience for them. Optimally future player type models should follow closely the research done by psychologists as they improve their understanding of the general human psyche. The fact that theories are abandoned does not mean that the research results are unreliable, but that they are gaining better and better understanding that clears the way from missunderstandings. It is worth noting that even though the MBTI is generally considered as an outdated and faulty model in psychology, it still is used to help open new perspectives to problems in social dynamics. Both game design typology and personality psychology are in progress of refining their understanding on how and why people behave, and both should benefit from working together.

## 42 FUNdamentals

In his game design book *Game On*, Jon Radoff (2011) seems to apply a short definition for games: "games are fun". Schell's (2008) definition goes: "A game is a problem-solving activity, approached with a playful attitude", but while analysing the definition, Schell also focuses on fun: "fun is pleasure with surprises". Radoff continues to define what is fun, by listing 42 of the most important fun things, backed by the psychologist Steven Reiss' (2002) 16 basic desires. These things are generally known as Radoff's 42 FUNdamentals.

We agree that a game can be designed to provide the user with any and all of Radoff's 42 FUNdamentals. We now proceed to take the FUNdamentals from their context of games and inspect them in the context of RGs. Many of them (18 out of the 42) can be provided by any kind of RG as well, and even more (26) by any kind of bi-directional RG. There are 14 further FUNdamentals that could be implemented on RGs, but that would be through gamification. Such are, for example, "being a rebel", "competition" and "nurturing".

"Achieving a sense of completion" is a FUNdamental that RGs rarely provide. Most of them are perpentual with nothing ever really being completed. Others contain finite stories, but it can easily remain unclear for the user, whether they have already really seen the whole of the story. A sense of completion tends to play a low role in RGs.

Finally, there are two FUNdamentals that the users cannot typically do within RGs: "recognizing patterns" and "creating order out of chaos".

The reason for this is that RGs are usually tools that do this for the users. *Google Maps* will find the best route for the user from place A to place B. *FourSquare* recognizes patterns around and in the user and recommends places the user might wish to visit.

Radoff's FUNdamentals is a good tool in making any application more appealing by making it more fun. They offer 42 good perspectives even for serious applications.

RGs typically do not contain intentional resisting forces, which is a significant difference to games. RGs are mainly cooperative. The aim of the RGs is to provide information, not to limit access to it. Certainly, opposing challenges may be motivating for some users, and intentional hindrances can actually help the system to deliver more information to the users by motivating them, but this is more about gamification placed on top of the RG than about RGs as such.

## SCHELL'S LENSES

Jesse Schell's (2008) *The Art of Game Design: A Book of Lenses* sets out to teach the readers "how to be a better video game designer", stating that the principles explored in the book "are more broadly applicable than that". The book introduces 100 "lenses" that designers can use to switch their perspectives to their design. This is the same concept that lies in the heart of Bartle's taxonomy of players, Radoff's FUNdamentals and even Benford's model.

Although in the second edition of the book Schell (2015) has increased the number of lenses to 112, we focus here on the original set of 100 lenses. When looking at RGs through Schell's 100 lenses, we perceive that most of them suit at least in certain cases, but there are 13 lenses that are really effective only with games, 4 lenses that need some adjustment and 10 lenses that do not suit RGs at all.

The lenses that do not fit RGs at all have to do with challenges and uncertainty. For games it is good to sustain tension by making the achieving of the goals difficult and uncertain. The point of RGs is to help in the transfer of information, which makes challenges and uncertainty typically counterproductive. One could consider inversing the lenses, to see that the feature described by the lense is minimized. However, the lens *#33: Triangularity*, where big risks are supposed to give great value and low risks less value, is symmetrical in a way that inversion is impossible. These lenses could be applied in gamified RGs, at least in the gamified part of the application. Assuming that *Ingress* can be considered as a RG, it is clearly a game, where the RG part is in finding the portals and the game part is in the challenges involved handling the portals.

One peculiar lens that does not seem to fit RGs is *#21: Functional Space*. Most typically for RGs, the functional space is the reality (be it physical or virtual). With some cases, like *Lost Turku*, this space may be focused on certain areas. Looking around anywhere else but on that one bridge, you do not see any game pieces. However, in the concept of the reality, the functional space, technically speaking, spans everywhere. This problem can also be found on some games. A live action role playing game can be focused, for example within one city, but there need not be restrictions for the players to travel outside – only that the other players and game events are unlikely to be found there.

Some lenses suit games better than RGs. They can be used in RGs, but they do not really give much extra value, especially comparing to how they help games. These are lenses about pleasure and punishment, rules, competition and cooperation. *FourSquare* clearly applies competition and cooperation, but if the users do not perceive *FourSquare* as a game, but rather as an application for finding one's friends, or good restaurants nearby, the competitive part of the application does not really play much of a part.

Some of the lenses suit certain types of RGs. There are lenses concerning character development and narrative in general that work well for RGs with strong narrative, but not so well, for example, for *FourSquare*. On the other hand, *FourSquare* can be seen through lenses that have to do with social visibility, such as *#80: Status*. This does not, however, fit *Vares*. Some RGs are made for a company as a *#90: Client*, but some have the company being built around the RG. Puzzles can be seen as an obstruction for transffering information, or a tool or a motivator for it.

There are four lenses that should be changed to suit RGs:

**#19 - Needs:** For games, the need that the game fulfills is deeper in the psychological imagination. The question is how the game creates a need and satisfies it to give pleasure. For RGs, one should consider what actual need the RG satisfies. Games generally do not feed a hungry player, but *FourSquare* can find you a restaurant nearby.

**#32 - Meaningful Choises:** This should be *Meaningful information*. The information transferred should be meaningful. In games this is not similarly within the ontology, as basically the only meaningful information is the information needed to win the game. For RGs, it is important that the information the user receives is meaningful.

**#34 - Skill vs. Chance:** This should be *Intention vs. Serendipity*. For serendipity, especially, users may wish to ask for suggestions (the application of "chance") from the RG. An alternative is to have the information to be transferred only per given parameters (the equivalent of a skill).

**#74 - The World:** RGs typically do not try to make an imaginative world better than the real world, but rather they try to improve the real world, either by helping people to make things better, or by bringing fantasy into the real world through augmentation. *FourSquare* and *Lost Turku* attempt to make the reality they are guiding the user to, somehow better and more interesting.

We have been studying the lenses against RGs through surveys and found 42 of the lenses such that they are generally applicable to all kinds of software development. One example is the lens *#12: The Problem Statement*, which recommends the designer to ask oneself questions such as: "What problem am I really trying to solve?" and "Is a game [Why not RG, or any other type of application?] the best solution? Why?" Another lens that fits RGs perfectly is the lens *#16: The Player*, which recommends the designer to consider what the intended players will like and how and what they expect to see in an application such as this. This lens encourages the use of player type analysis tools, such as Bartle's player types, which Schell even describes in his book.

## BENFORD'S SHARED SPACES

Steve Benford et al. (1998) provide a general framework to understand the differences of shared-space technologies. This is a framework that was not originally developed for game design, but it has been often used for game design analysis, especially for virtual, mixed, altered and augmented reality games. The framework is originally three dimensional, but the third dimension, *spatiality* was not as powerfully portrayed together with the other two dimensions, *transportation and artificiality*, which were portrayed together. Therefore, the *spatiality* dimension is often omitted as the framework is cited.

The *transportation* axis indicates the level to which the users leave behind their local space, and the *artificiality* axis the level to which a space is computer generated. By using these two dimensions, four types of technology can be classified: Physical reality resides in the local, physical world (i.e., the things are tangible and the participants

are corporeal). Conversely, virtual reality allows the participants to be transported to a remote, synthetic world. In telepresence, the participants have and experience presence at a real world location remote from their physical location (e.g., remote controlled drones with sensory feedback). In augmented reality, synthetic objects are overlaid on the local environment.

RGs can typically be used on-site and off-site. Depending on the case, the application is used either as augmented reality or virtual reality. Either the inherent artificial model of the location is used to add synthetic artefacts to the actual reality where the user is, or the model is used for a virtual world into which the user immerses. At the moment, all effects of the user's actions in reality guides are virtual without physical substance. The user may move a digital marker from one location to another, but cannot move an actual stone anywhere. This border may blur as 3D-printing technology evolves and the Internet of Things arises, where network connected devices in our environment may start reacting to the virtual models. If a user generates a chair in a room within a RG, an automated 3D-printer may start and print the chair. Strictly speaking, it would still appear here that the border of virtual and physical will not get breached, but it is only physical artefacts reacting to virtual events and artefacts.

Starting from the original physical location of the user, on the bottom left corner of Benford's diagram, RGs initially move the user higher towards the augmented reality. With Oculus Rift, it is possible to attain *a complete augmentation of reality* at the top of the diagram. For any horizontal movement, the service must be engaging enough to create immersion on the user.

Benford's transition seems to focus on where the user's actions have effect. With teleconferencing, certainly your voice (and image) are transferred to the other location, but all manipulation you do is local. In telepresence you generally have some kind of agent to relay your actions to the external location. Augmented reality gives you local virtual artefacts that you can manipulate. Even though their essence is stored in a database in some distant location, the conceptual location of them is "here". In virtual reality the user manipulates objects that are located in a virtual environment, to which the user is transferred.

RGs are typically located on the border of augmented reality and virtual reality, as shown on Figure 5. For example, in our RG project *Lost Turku*, we have a virtually reality of a reconstructed real location of Turku 200 years from history. It can be observed in its current location, and it can be visited off-site as well. It is our intention that the visitors can leave their marks there and later visitors can find them. Off-site visitors will find the virtual reality touched. On-site visitors will observe exactly the same, except that the virtual reality serves as an augmentation of their physical reality.

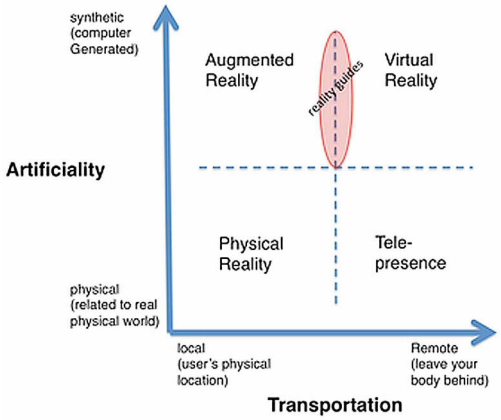
## CONTEXTUAL GAME EXPERIENCE MODEL

Frans Mäyrä (2007) and Laura Ermi (2005) have been working on a framework for analysing game experiences. The earlier SCI-model of gameplay experience concerns what is happening *prima facie* during the performance of play and the later Contextual Game Experience Model considers the involved contexts.

At the SCI-model core are three kinds of immersion: *Sensory*, *Challenge-based* and *Imaginative*. (Later Mäyrä (2007) uses the terms *action-based immersion* instead of *challenge-based immersion* and *mental immersion* instead of *imaginative immersion*.)

*Sensory immersion* is typically related to the audiovisual and kinetic execution of games. The sensory immersion is beneficial to certain types of RGs, but actually harmful for certain other types. Virtual museums attempt to take the user back in time and immerse the user in the guide. Car navigators aim at being as invisible as possible,

*Figure 5. Reality guides in Benford's taxonomy*




keeping the driver aware of the driving situation while trying to augment the driver's understanding of the situation with information on where their overall destination is. For all kinds of games, where the SCI-model has been designed to be used, it is desirable for the players to immerse their senses in the game as deeply as possible. With RGs this immersion can go either way: Either the user's senses are immersed in the guide, or the guide is embedded in the user's senses.

The *challenge-based (or action-based) immersion* of the SCI-model is the one that is least applicable in a RG. It can be applied in a RG that is a game, but there the application has a dualistic essence and the challenge-based immersion is involved in the game part. RGs are more like assistants that attempt to make transfer of information as easy as possible. For example, in *Ingress* the RG part tells the user without any challenge where the portals are and to which faction they belong. The challenge arises in that the player has to physically go to the enemy portal location and stay there for a period of time, in effort to claim the portal.

The *imaginative (or mental) immersion* has the user immerse in the application due to a captivating narrative. This works equally with RGs and games. Games like *Ingress* and virtual museums like *Paris 3D Saga* and *Lost Turku* all aim at immersing the players in the story of the application. A car navigator could be incorporating the car drive as a story of how they are taking the evil ring to a volcano at a distance. On longer stretches of driving straight on a freeway, the navigator could generate dialogue for the fictional characters and upon an approaching turn it could alert the characters as well as the driver about something looming ahead – as long as the driver is not being excited by the narrative too much to cause reckless or careless driving. The story may augment the reality, but not obfuscate it. The application could easily be better in this than the traditional listening of audio books, music or radio, none of which are in any way aware of the driving situation. An RG could know to alert the user to the foct of the upcoming intersection rather than to the exiting fiction.

In the Contextual Game Experience Model, Mäyrä embedded the SCI-model inside five contexts. According to the new model, playing game is linked with the *immediate personal contexts* – how they play and what motivates their play. This would involve Radoff's 42 FUNdamentals and Reiss's 16 basic desires. Clearly this is equally significant for RGs, as it is for any applications or services that are selected by consumers directly and not imposed by authorities.

Another context in the model is the *immediate social context* – how the player's closest people regard game playing. Mäyrä takes this apart from the FUNdamentals ("Strengthening a Family Relationship") and basic desires ("Acceptance", "Family", "Social contact", "Social status") possibly because it is to be regarded differently as a context that is external to the game, instead of a motivator that is internal to the game and fulfilled within the game. This context relates with the technology acceptance model and is equally significant for RGs as it is for games. If a person's closest people all generally look down upon RGs, the person is a rebel in their immediate social context, if they choose to use them. People are more likely to use RGs, if other people in their immediate social context have a positive attitude towards them, and even already use them.

Third context is the *context provided by the earlier forms for Game and Play*. In addition to how the immediate social context considers using RG applications, also the person's familiarity to them affects their attitude towards single applications. Also, this context exists for all kinds of applications, including RGs. Users will always compare applications to their known frameworks of reference. Familiar concepts are comfortable, but clearly different concepts can stand out greatly, either for the better or the worse.

The fourth context is the *context for digital games' production*. In addition that new applications seek their place in the user's own frame of reference applications and experiences, they become related also to all other contemporary applications, even if the user has not even heard of all of them. This context affects the culture around the user and has an indirect impact. One of the clearest effects is the visibility an application gets and how popular it becomes with other people. The direct equivalent for this context, of course, exists for all kinds of applications.

The fifth context, which includes all the four other contexts, is the *wider context of social norms and values*. This, of course, applies also to RGs just as well as to any other applications.

It is clear to see that the contextual game experience model is drawn out of game design analysis, but still the outcome is something that can be applied much more widely. Only the challenge-based immersion in the SCI-model core has very little use anywhere else than in games. Even this can be helped by considering the negative challenge, which would be how easily the application provides the user with what they are searching for.

## NARRATIVITY FRAMEWORKS

To understand the difference between storytelling and games, Espen Aarseth (2012) separates the narrative content into two groups: kernel and satellite. The term *kernel* refers to the essential content of the story or game that is repeated when it is experienced anew. Basically, the kernels form the identity of the story: If we change a kernel, we will end up having a different story. In comparison, *satellite* refers to content that could be omitted or altered without changing the identity of the story. For example, the identity of the story of Cinderella remains the same, whether she has one or two stepsisters or whether her chores include cleaning the house or peeling potatoes; however, the identity of the story would change, if Cinderella's father had died and her mother would have remarried.

Within the kernel–satellite framework the reader or player could have three kinds of influence: no, limited or full (see Table 2):

*Table 2. Using kernels and satellites to differentiate stories and games*

| Kernel Influence | Satellite Influence Not Possible | Satellite Influence Possible |
|---|---|---|
| No influence | Linear story | Linear game |
| Choose from alternatives | Non-linear story | Quest game |
| Full influence | N/A | Pure game |

1. If the user has no influence on the kernels and the satellites, we have a linear story (e.g., a novel or a film).
2. If the user has no influence on the kernels but can influence the satellites, we have a linear game (e.g., *Half-Life*).
3. If the user can choose the kernels from a set of alternatives but has no influence on the satellites, we have a non-linear story (e.g., hyperfiction).
4. If the user can choose the kernels from a set of alternative and can influence the satellites, we have a quest game (e.g., *Star Wars: Knights of the Old Republic*).
5. If the user can influence both the kernels and the satellite, we have a (pure) game (e.g., chess).

With respect to RGs, the key question is whether we want to impose a narrative structure that the users have to follow. To compare with the previous list, we can have following types of RGs:

1. The users are limited to follow one ideal path (e.g., a car navigator leading the driver to the desired destination).
2. The users follow a path through different locations, and at each location they can wander around and create their own content (e.g., guided tourist group visiting different sights).
3. The users can choose from given alternatives where they go next, but at each location they have beforehand-prepared content waiting for them (e.g., orienteering, *Geocaching*, or *Vares*).
4. The users can choose from given alternatives where they go next, and and at each location they can wander around and create their own content. (e.g., *FourSquare*)
5. The users are free go wherever they want and to act however they want. (e.g. *Wikipedia*)

We can compare different narrative forms based on their four typical features (Aylett & Louchart, 2003):

- **Contingency:** How much does the story time and space depend on the real time and space?
- **Narrative Representation:** How is the story presented?
- **Presence:** How far does the viewer/participant share the story time and space?
- **Interactivity:** How much does the viewer/participant participate in the story generation process?

Based on these four features we can divide different narrative forms as shown in Table 3. Virtual reality (e.g., computer games) differs from the other forms of storytelling in that the story time and real time are highly contingent, whereas in traditional forms of storytelling (e.g., cinema or literature) this dependency can be quite loose. For example, we can jump forward or backward or even construct the narrative in an unusual way such as in the film *Memento* which inverts the chronology of the narrative. Another differentiating factor is interactivity, which is non-existent or rather restricted in other forms of storytelling, whereas in computer games it is an essential part of how the narrative is presented in the medium.

In RGs the contingency is strong as it is linked in real-time to the user's position, and the current status of the augmentation data on the service. The narrative representation is most commonly

*Table 3. Comparison of different narrative forms*

| Feature/Form | Cinema | Theatre | Literature | Virtual Reality | Reality Guides |
|---|---|---|---|---|---|
| Contingency on time and space | low | medium | low | strong | strong |
| Narrative representation | visual | visual | mental | visual | visual |
| Presence | not physical | physical | not physical | not physical but immersive | physical with non-physical augmentation |
| Interactivity | no | no/yes | no | yes | no/yes |

visual, but can also be mental depending on how much textual information is included. The presence is typically physical with non-physical, as the user is following the RG in real-world locations; otherwise, it is not physical. RGs allow the user to interact with the story.

A digital medium offers the user *affordances*, which are opportunities for action made available by an interface. According to Murray (1997, pp. 71–90; 2012, pp. 51–80) a digital medium has four affordances:

- **Encyclopaedic Affordance:** Digital medium can store a vast amount of (possibly semantically segmented) information in various formats.
- **Spatial Affordance:** Digital medium can represent a navigable space.
- **Procedural Affordance:** Digital medium allows us to specify conditional, executable instructions.
- **Participatory Affordance:** Digital medium allows the user to manipulate the content and processing.

These affordances make the digital medium a vehicle for literary creation: the procedural and participatory affordances make it interactive, and the encyclopaedic and spatial affordances make it immersive. We can recognize all of these features also in RGs.

Aarseth's framework is a convenient tool for analyzing digital narratives. However, its terminology need not be as game oriented as it is. Not all narratives where you can influence the satellites are games. People can tell each other stories and stories may emerge from RGs, social media and other types of innovative applications without restrictions to kernels or satellites, and yet these are not necessarily games.

## DISCUSSION

Observing the frameworks presented in this paper, we have discovered a lack of scientific foundation and foundations of subjectively restrained empiric experience. This begs the question whether they have missed certain points. Are Bartle's eight player types sufficient or should there be something that combines features, for example, from the *griefer* and the *hacker*? Why are there precisely 42 FUNdamentals in Radoff's set or eight core drives in Octalysis? Even more suspicious is the nicely round amount of 100 lenses that Schell offers.

Furthermore, the frameworks are not exclusive to games. What differentiates RGs from games would appear to be that games benefit from challenges and uncertainty of success. As we observed when analysing Schell's lenses, the point of RGs is to help in the transfer of information, which is why challenges and uncertainty are counterproductive. RGs can act as a platform for games that offers challenges, but the RG part provides its own function and the challenges lay on the game part of the application. RGs differ from games by helping us to satisfy our intrinsic needs, such as hunger or trying to find things, rather than extrinsic needs

that are created and exist within the application, such as achieving a goal or scoring points. RGs typically try to improve the real world, rather than present us with an imaginative world better than the real one. Regarding the distinction of RGs and game, we can ask if a RG has game-like features, are those mainly just laid on top of the RG using it as a platform, or should they be considered as a fundamental part of the RG.

The concepts of gamification and game are still defying definitions. We can easily imagine using the Octalysis as a framework to help creating interesting RGs. Putting in "epic meaning and calling" is a part of having an interesting story within the application to help the user better understand what to expect from the application. However, is this already about building a serious game, or at least just gamifying the design concept? If putting storylike features in an application makes it gamified, does this mean that all ebooks are gamified applications or even games? If not, then what is the definition of 'game', where Octalysis, or any other of these frameworks is clearly more efficient tool for specifically game design, rather than general interaction design? One reason for this disintegration might lay in the inorganization of game research field. We are having different people coming from different fields with their own perspectives and concepts. This is richness, but it also causes people coming from the game industry talk only about the design of games, neglecting the idea that the ideas could be even more general. Eventually, there will always be pigeons that do not fit any hole, because reality defies all classifications. Yet, the field of game research is still on its early phases of building definitions and in these times a lot of results can be gained with relatively small amounts of work.

RGs are an outcome of mobile and ubiquitous services, social media and global positioning system. The rise of new technology, such as the Google Glass and Microsoft HoloLens are paving way for greatly enhanced new augmentations of reality and thereafter for RGs. Also between hardware and software, programming tools such as the Unity game engine have increasing support for connecting computer-generated assets to mobile device camera input.

The features of RGs are formed now in an era of agile methodologies and gamification. We still hesitate to include Wikipedia in the category of RGs, but to clearly cross the threshold all they need a mobile application that taps into user location data and quickly gives the users information about places and things near to them.

We find the transfer of information as an essential part of RGs. Before the written word, history was stored in stories told verbally by one generation to the next. Narrativity is, therefore, understandably present basically in any RGs, although its presence can vary greatly. It can be explicit, when the RG is in the form of a story, or implicit, when the user sees a story in the information given by the RG, although it is not actually in a story form. This is related to the anthropomorphizing phenomenon, where people state how "the phone refuses to work", even though the phone device obviously has no sentience required to actively "refuse".

In the oral tradition of storytelling, a bard would adapt the story depending on the audience – even the structure of the story could vary within a certain confines. The development of digital storytelling devices is also putting an effort on this aspect. In RG applications, we can consider, for example, a tour guide visiting the same location and telling different stories depending on whether the tour group consists of schoolchildren or pensioners and on the group's questions and reactions. Similarly, a good RG can adapt to the feedback from the user.

In narrative theories, the concept of a magic circle (Huizinga, 1955), where the user is immersed in a sealed reality of the story, plays an important role. All experiences come from this world in the fashion of a virtual reality. The magic circle can be broken, if the user's phone starts to ring or someone in the real world begins to talk with them. Input from the real world does not always necessarily break the circle, if the other

person is also within the circle such as in a role-playing game. What is still developing, however, is the application of social media as a source of material for a digital story. Most RGs allow sharing the in-RG actions and events in the social media. This could also be bi-directional, where people not directly involved in the particular RG could some way to affect the story within the RG. The RGs could maintain polls or questionnaires in social media to have people answer, or they could look into material people publish, for example, with certain hashtags. A fantasy story could find descriptions for dragons by looking for the hashtag #dragon. In addition to the questions arising on the immaterial rights, there are others concerning how well the magic circle can be sustained with this kind of mining of material.

Aki Järvinen (2009) discusses how games built for social media as a platform should be designed using the paradigms of the social media server in question. A person playing a game in Facebook should not find the game interface and mechanics alien to Facebook. How should one design a game that is not built to run on a social media service, but to apply social media, for example, for social connectivity and content harvesting? What are the juridical issues?

Our intention for this chapter was also to consider the exploitation of social media in RGs, but there seems to be little research on this topic so far and we are yet only about to conduct our own empirical research. Social media seems to be currently as high in popularity as games and gamification. However, where the users of gamification consists of system and product developers, social media has been found most interesting by the marketing people, media and politicians. In games, social media is typically used to announce the players' friends that they are playing the game, which is hoped to attract the friends to also start playing. We perceive that social media could be used as a mechanism in games and RGs, at least for user communication and to provide raw material for a story engine through text mining.

Applying social media as a part of a game mechanism is not simple. In the beginning of the popularization of personal home computers, the applications were delivered as finished and polished products. In the next phase, the applications were provided with bug-fixing patches, and after a year or two the application would finally be fully functional in the user's computer. With the further spread of the Internet, it is now more typical that any application gets almost regular updates that often even add new features in the application and the application is never really finished or even error-free. The next interesting phase in this line is the interconnectivity with third-party service interfaces, especially social media. Nowadays applications are often used online and they include buttons to share content in *Facebook* or *Twitter*, for example. If one of these services change their application interfaces remarkably – let alone that they completely cease to exist – the question arises, how usable are the applications with interconnectivity to them.

It is also easy to stumble and fall in the social media (Mäntylä, 2014). One cause for abusive attacks from the social media would appear to be brands being forced into the social media. The social media is perceived as "People's Web" and the users retaliate the violation of this (Fournier & Avery, 2011). The important task is then to offer people something they want, instead of coercing them into something you want, which leads to the idea of gamifying your service – to appeal to the intrinsic motivators of the users.

## CONCLUSION

In this paper, we reviewed different frameworks that aim at helping the design and analysis of games. Often these frameworks are rather holistic for the game design process, considering also general application and service design issues, rather than focusing on issues explicit for games. This becomes easy to see, when trying to apply

the frameworks on other kinds of applications, such as RGs as we have done in this paper. There are, however, several issues addressed in these frameworks that are explicit for games, and issues in-between. Some parts of the tools are therefore inapplicable on RG design. Other parts are applicable on both games and RGs, but likely inapplicable for some other types of applications.

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## KEY TERMS AND DEFINITIONS

**Affordance:** An opportunity for action made available by an interface.

**Augmented Reality:** A real-world environment that is supplemented with computer-generated elements.

**Game Design Lense:** A tool for reviewing and reassessing game design, which comprises thematic questions that the game designers should ask themselves.

**Game Design:** The art of creating rules, goals and challenges for a game.

**Interactive Storytelling:** An interactive system where the player's decisions affect on run-time how a dramatically compelling story is being generated.

**Kernels and Satellites:** Kernels are the essential parts of a story, which cannot be changed without the identity of story being changed as well. Satellites are part of story that can be changed while the story remains identifiable.

**Octalysis:** A tool for analysing game design based on players' eight core drives.

**Player Type:** An abstraction of common attributes that many players share.

**Reality Guide:** An application that aims at assisting, teaching or supporting the user in the real world.

**Shared Space Technology:** Distributed electronic environments that allow participants to make use of spatial properties to manage their communication.

**Tomi ”bgt” Suovuo, Natasha Skult, Tapani N. Joelsson, Petter Skult, Werner Ravyse and Jouni Smed**

## The Game Experience Model (GEM)

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III

# Chapter 8
# The Game Experience Model (GEM)


**Tomi "bgt" Suovuo, Natasha Skult, Tapani N. Joelsson, Petter Skult, Werner Ravyse, and Jouni Smed**

## Contents



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**Abstract** For over a decade now game research has aimed at describing the game experience by attempting to see it from one perspective. In this paper, we collect, analyse, and merge together this work. As a result, we claim that a game experience is composed of three pairs of elements, none of which can be removed, or the system in question is no longer a game. These elements are: (1) the game mechanics and action, (2) storyworld and narrative, and (3) aesthetics and sensory stimulus. This model can be illustrated in the form of a gem that encloses the fantasy and immersion of a game. Apart from games, this model is applicable to all kinds of storytelling, particularly interactive kinds. Beyond games, the different facets of the gem can be used by ignoring elements absent in the given narrative media.

**Keywords** Gameplay models · Game mechanics · Action · Sensory stimulus · Narrative · Aesthetics · Storyworld

## 8.1 Introduction

When Hunicke et al. (2004) introduced their MDA (mechanics, dynamics, and aesthetics) framework to help the game industry to design “desired experiential results of gameplay”, they playfully noted that “there is no Grand Unified Theory of games”. This has not prevented many authors from forming their own, all-encompassing models for analysing games. These include game experience theories and frameworks such as Smed and Hakonen (2003), Björk and Holopainen (2004), the MDA model of Hunicke et al. (2004), the SCI model of Ermi and Mäyrä (2005), and the game immersion model of Adams (2013). In our earlier work (Mäntylä et al. 2014), we analysed and compared these models and presented an initial fusion of these highly similar models. In this chapter, we continue this work and present a new fusion model called the *game experience model* (GEM).

This work was originally inspired by the observation how Adams seems to agree with Ermi and Mäyrä about the existence of narrative immersion, and another one, which Adams calls “tactical” immersion and Ermi and Mäyrä “challenge-based” immersion, whereas the third channel of immersion Adams mentions is “strategic” immersion but Ermi and Mäyrä lists “sensory” immersion. Both models seem to make sense in their own right, and they have a significant replication, as a good scientific theory should have, despite that there seems to be a gap between them.

The GEM is intended to be a tool for both analysing and designing games. It should help one to feel confident that no part of the game experience is neglected in the design process. The GEM attempts to be the guide to the anatomy of the gameplay experience, helping the designers to pay attention to the equivalent ergonomics—making sure that the game is properly designed to suit the intended audience. As a fusion of several frameworks, the GEM functions as an interpreter between different models. When investigating the design ideas from researchers focusing on a different framework behind their thinking, this chapter in particular

should help in using the GEM as a tool to translate the ideas from one framework to another.

In this chapter, we present first the outcome of our analysis as a fused theoretical game experience model in Sect. 8.2, followed by a more-detailed analysis in Sect. 8.3. In Sect. 8.4, we compare the GEM with the earlier models presented in the literature. This is followed in Sect. 8.5 by some example analyses of games that demonstrate how games can be dissected using the GEM. Finally, the concluding remarks appear in Sect. 8.6.

## 8.2 The Structure of the GEM

The GEM recognizes six elements of a game experience and the relationships between them. Figure 8.1 illustrates the GEM as a triangular cylinder (or a prism) with six vertices and five faces. The vertices form three pairs:

- *Mechanics—Action*: Mechanics include all the actions that can occur in the game and all the game objects—everything defined by the rules of the game. Action is how the mechanism functions in each situation.
- *Aesthetics—Sensory stimulus*: Aesthetics include all the sensory and cognitive designs aimed to evoke emotions in the player. Aesthetics presented to the player is called sensory stimulus.
- *Storyworld—Narrative*: Storyworld provides the substantial content for games. It includes all the events and things in the game universe, both the ones that become actualized during the gameplay, as well as the ones that do not, or even could not, because they were not put in the game, only imagined by the game designers, or through becoming logically necessary, or likely, due to circumstances that are included. Narratives are the pieces of the story from the storyworld that occur during gameplay.

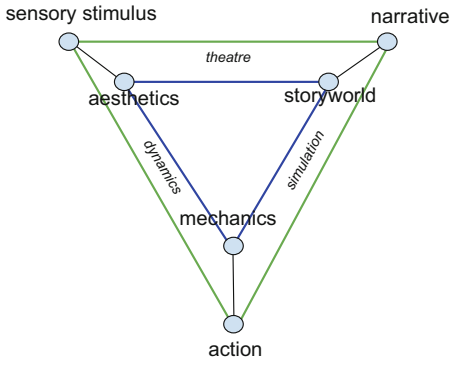


**Fig. 8.1** The structure of the GEM as a flattened triangular cylinder

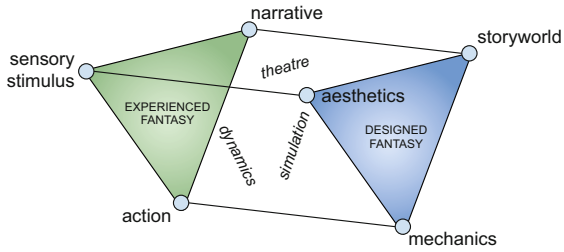


**Fig. 8.2** The structure of the GEM as a prism

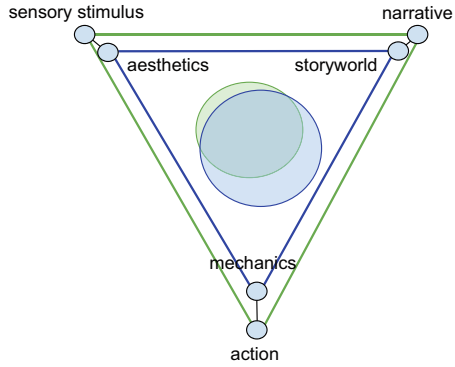


**Fig. 8.3** The actualized Designed Fantasy and actualized Experienced Fantasy within the GEM typically have an offset, and the players may form a greater or smaller fantasy than the designers intended. Also, the full potential fantasy of the game is a larger space than neither the designers nor the players will ever explore

The three side-faces of the cylinder are labelled *dynamics*, *theatre*, and *simulation* (see also Fig. 8.2). The upper face, *Designed Fantasy*, involves the elements of mechanism, aesthetics, and storyworld. These higher-level elements are expressed by the game through the elements of action, sensory stimulus, and narrative residing at the lower face, *Experienced Fantasy*.

The game experience can be viewed from each of the five faces. The player experiences the game through their own personal narratives experienced during the game, as well as the actions they have taken and the sensory stimulus they have received. They can perceive the greater whole through the *Experienced Fantasy* face, but it is the primary interface they have.

Game designers perceive the game through the opposite *Designed Fantasy* face, constructing the whole fantasy of the game, fitting the storyworld, game mechanics and aesthetics together, which all form the greater idea behind what is concretely given to the player to experience. The game designers are likely to expect that their designed fantasy would match the experienced fantasy as closely as possible (see Fig. 8.3).

There is an interesting phenomenon, where the game designers perceive that the whole of the created game is located within the GEM as a certain shaped bubble at

a certain location, but the player community actually appear to perceive a different bubble at another location. In particular, open world games can be seen in many different ways. A player can ignore the main story and go exploring the realm of *Skyrim* (Bethesda Game Studios 2011), focus on taming all the different animals in *Far Cry Primal* (Ubisoft Montreal 2016), or just drive around with the cars in *Grand Theft Auto V* (Rockstar North 2013).

We can look at a game through the *dynamics* face between aesthetics, stimulus, mechanics, and action. This face ignores the story and motivation of the game, observing it merely as a spectacle akin to a sports performance. This face is essential for games such as chess, where there is no real story or the story comes from outside the game such as in *Ingress* (Niantic 2013). The whole elegance of the game aesthetics and player actions can be seen through this face, which is traditionally the case in several sports such as figure skating and ski jumping.

Looking at a game through the *theatre* face between aesthetics, stimulus, storyworld, and narratives, the rules of the game disappear, and what remains is a sequence of events, as in a movie. This is a face essential for entertainment applications, where there are few, if any, player controls. As the element that provides participation, the mechanics are, what essentially separates games (including all forms of interactive storytelling), a part of other forms of art.

The final *simulation* face is the one between mechanics, action, storyworld, and narratives, where actions and their causalities are clear, but their representation is ignored. This is equivalent to low-level simulations, or text-only adventures. The simulation face perceives only the pure gameness of the experience, ignoring the aesthetics. The challenges of the game arise mainly from the mechanics and narratives that explain what the players are supposed to be doing in the game. The same essential action can be represented in several different ways, using visuals, audio, and other sensory stimulus.

These six elements are the components that form a game. They are distinct from other relevant elements involved in the gameplay as they are built in the game and invariably the same anytime and anywhere the game is played, or else it is a different game. Social interaction, for example, is a context, where the game is being played. The game mechanics may support social interaction, but the social interaction varies based on the society where the game is played.

## 8.3 Looking Deeper into the GEM

The idea of "core fantasy" as the centre of what a game is can best be explained through a failure to sell such a fantasy. Paul Kilduff-Taylor talks about the conceptual failure of their game *Frozen Cortex* (Mode 7 Games 2015) during the GDC 2016 "Failure workshop" (GDC Vault 2016). In the preceding game, *Frozen Synapse* (Mode 7 Games 2011), the player's and their opponent's turns play out simultaneously, but each player (or computer opponent) is able to plan out their actions beforehand. *Frozen Cortex* plays much in the same fashion, but the core

difference is that while *Frozen Synapse* is a game where soldiers kill each other, *Frozen Cortex* is a game of future-sports, where robots compete to bring a ball over to the end zone and score a touchdown. Unfortunately, the game was not as successful, which Kilduff-Taylor called a “conceptual failure” brought on by the failure to sell their audience on a proper core fantasy. He reflects:

> Thinking back to all the games that I really, really liked, and what we’ve done with *Frozen Endzone*, we had this problem where there wasn’t a kind of core fantasy at the heart of it, nobody really wanted to be sort of managing a futuristic sports’ team with tactical stuff. Nobody really wanted to do that. While being a space pilot, doing all the other things you can do in other types of games, they’re fantasies that people have, they’re things that people like.

The core fantasy of a game, as defined by him, could be summed up in a series of questions: “What are you doing in the game, what do people want to do, what’s exciting about the idea?”. Everything else, then, builds up from this core fantasy: the aesthetics of a game is how you convey it to the player, sound and music design likewise, as are the various mechanics of the game. It is important to note that in our definition, fantasy is distinct from “story” or “narrative”, although they are generally central to the ability to sell the fantasy of a game (much like the aesthetics of the game overall, and the actual mechanics once you are playing it). It is also important to remember that fantasy is by its very definition individual: it exists within the player’s mind, not as something external or objective. And finally, a single game can cater to many different fantasies, and it may well be that the core fantasy *intended* by a game differs from the experienced fantasy of the player. For example, *X-COM* (Firaxis Games 2012) might appeal because it is a game where you get to be a master tactician, always a few steps ahead of your opponent, winning against impossible odds because of your superior brawn. Or the appeal might come from the player’s position as an underdog, winning desperate, pyrrhic victories in a fight they are destined to lose. Or then it might be appealing because of the personal stories of the player’s squad members, their failures and successes, and their growth from pathetic rookie to unstoppable alien-killing machine. These individual fantasies are then facilitated by various gameplay mechanics and aesthetic choices; one of the most important being how your squad members gain ranks and skills and can be individually named and their appearance customized.

Good game design accepts that what needs to be captured is the player’s imagination, and what needs to be catered to is the target audience’s fantasies. That is why *Frozen Cortex* failed, because the core audience of strategy games was not interested in embodying the manager of future-sports robots. Kilduff-Taylor points out that all the other aspects, visuals, mechanics, audio, and so on, were improved on or remained the same. The failure came solely from a failure to engage in a proper fantasy. Jesse Schell (2008) would probably call this the “experience” that elusive thing that all game design strives for, yet which is not the game itself; “Game designers only care about what seems to exist. The player and the game are real. The experience is imaginary—but game designers are judged by the quality of this imaginary thing because it is the reason people play games”. Schell (2008, p. 11)

Narrative remains important to the notion of fantasy, but not in the traditional sense of narration from game-to-player; rather, if fantasy is an intangible thing happening in the mind of the player, then *their narration of their experiences* constitutes the tangible, existing expression of their fantasy. How well a player is able to narrate their own experiences is a good marker of how well a game has managed to tap into some particular fantasy.

Although we state, especially in Fig. 8.3, that aesthetics, storyworld, and mechanics are foremostly what concerns the game designers, and that sensory stimulus, narratives, and action are what the player foremostly experiences, this must not be seen so that the first triplet would neither affect the play experience nor vice versa. The narratives are a representation of the storyworld, and the making of the GEM consists of how well the storyworld is conveyed to the player. This applies as well to the sensory stimulus representing and conveying the aesthetics, and the action representing and conveying the mechanics.

Fantasy differs from agency, where agency requires a sense of power to influence the narrative, whereas fantasy only requires the immersion into the narrative. Immersion can improve, if the player can influence the narrative. Agency can improve the fantasy, but fantasy can exist without agency. Fantasy is more active than suspension of disbelief. Suspension of disbelief mainly relies on the mechanics and narrative playing together, so that the player can accept the mechanics behind the narrative. However, suspension of disbelief only requires the player to believe, what is taking place, whereas fantasy involves also the aesthetics. The player needs to enjoy the feelings that the gameplay provides.

### *8.3.1 Mechanics and Action*

Sicart (2008) defines game mechanics as "methods invoked by agents, designed for interaction with the game state" following the view of Hunicke et al. (2004) which states that mechanics "describes the particular component of the game, at the level of data representation and algorithms". Adams (2014, pp. 352–353) breaks this down and lists five major types of game mechanics:

- physics (e.g., Newtonian mechanics or cartoon physics)
- internal economies (i.e., rules governing creation, consumption, and exchange of quantifiable resources)
- progression mechanisms (i.e., progress through a series of challenges)
- tactical manoeuvring (e.g., taking place in largely open or semi-open spaces)
- social interaction (i.e., rules that control the relationships among players)

Game mechanics make the gameplay possible and drive it forward. These progression mechanisms can be divided into two categories (Juul 2005, pp. 72–82): games of emergence and games of progression. In *games of emergence*, the flow of events emerges from the operation of the rules, and the events are not pre-planned by the game designer. For example, chess, bridge, and *Tetris* (Pajitnov 1984) rely on

emergence to make the gameplay interesting but there is no premeditated sequence through which the events unfold. In *games of progression*, a predefined system causes the player to experience the game in such a way that certain events are certain to follow other events. This progress can happen through space (e.g., enforced by level design), time (e.g., events are triggered in predefined time intervals), or a story (e.g., the player progresses through a narrative that triggers events and gets triggered by player-initiated events).

Mechanics include the rules of the game, which forms an essential aspect as Huizinga (1955, p. 11) observes: “All play has its rules. They determine what ‘holds’ in the temporary world circumscribed by play. The rules of a game are absolutely binding and allow no doubt”. A significant subset of the rules is the “set of actions that the system can logically process” as an input from the player (Szilas 2004). The mapping between this set of logical actions and the set of physical actions enabled by the user interface is the essence of the connection between mechanics and action. Moreover, mechanics and action involve the participatory affordance (Murray 2012) in games, making the opposite face of the GEM involve mostly non-interactive forms of storytelling, and not actual games. One could say that “traditional art” such as movies lack interaction and mechanics completely. Nevertheless, even they have an agreement, in the sense of Adams (2013), between the audience and the storyteller commonly known as “suspension of disbelief”. The audience must be able to relate to the story and the characters, and this is where a glimmer of mechanics shines through the GEM even in these mediums. The reality of the narratives must make sense to the audience—this reality of the story belongs to the mechanics element of the GEM.

The action-based immersion modality is connected to the strategic one. It remains quite hidden in turn-based games (e.g., chess) where it mostly manifests in the player’s skill to plan ahead several moves or estimate the probabilities of consequences. In fast paced games, action-based immersion modality manifests more clearly in reaction speed, accuracy, and even strength.

A game can have different gameplay modes, for example, driving mode and conversation mode. In the driving mode, the player’s action of pressing the controller key X could mean accelerating, but in the conversation mode, the same key X could mean choosing a dialogue item from a menu. The same action in different modes would thereby be mapped to a different game mechanic.

Action is not equivalent to the rules of the game, as a bad interface design may prevent the player from taking an action that would be valid according to the rules/mechanics. The action element also includes technical problems such as the inaccuracy of the GPS in a location-based game (Benford et al. 2006; Jacob and Coelho 2011) or an adware-game advertisements disrupting the gameplay (Lewis and Porter 2010). In the latter example, the player may try to click on an icon to close the advertisement but the advertisement either closes just before the player clicks or it does not catch the player’s click rather than letting it pass through to the game. In either way, the action becomes an unintended click on the gameplay.

Today a typical game is controlled by a standard game console controller, where the buttons and joysticks are assigned differently for each game (Blomberg 2018).

There does exist certain conventions followed by a majority of games. These are equivalent to the standard of an aircraft nose lifting, when a joystick is pulled back (essentially downwards) and diving in the opposite direction. However, these conventions are not always followed, and sometimes even within a single game, a certain action can be done with different button in different situations. An example of the latter is how firing a weapon in *No Man's Sky* (Hello Games 2016) is performed with one button when controlling a vehicle and with another button when the game character is on foot. Achieving immersion is affected by the need to adapt to a new control layout, especially if the layout alters during the game.

A significant difference between action and mechanics is that action refers to the concrete application of mechanics. In puzzle games, the puzzles as such are a part of the mechanics element as is their fundamental solving, but the application of the game controls to perform the operations required for the solution are part of the action element.

When a game mechanism is off balance, it is a design failure. When a player is unable to execute a valid action, it is an implementation failure. Design failures are observable through the design facet of the GEM and implementation failures through the experience facet. An example of this can be seen in David Newton's reviews of the game *Prince of Persia* (Mechner 1989) in a great variety of different platforms. As a matter of mechanics, (Newton 2014, 7:20–7:27) describes, how the Nintendo Entertainment System (NES) version of the game uses scrolling of the screen because the whole scene does not fit the screen simultaneously, unlike in most other versions. Also, the mechanism of switching places with an opponent during a fight has been removed as a game mechanism in this version (Newton 2014, 8:08–8:13). Newton (2014, 6:20) states in his review: "The mechanics of the game are nice and precise", where GEM would rather recommend the word action instead of mechanics, as he is speaking of how the player experiences the swiftness of their control affecting the character in the game.

### *8.3.2 Storyworld and Narratives*

Essentially, the storyworld is typically an infinite universe, envisioned by the game designers. The narratives are the pieces of storyworld that the player experiences in the game. They have made aesthetic representations of part of this universe, in the form of plots, text descriptions, action scenes, sounds, art, and others, which are presented to the player as a narrative within the storyworld during gameplay. The player also typically generates their own narrative through induction. Particularly in games with a lot of simulation, but little dialogue, such as *RimWorld* (Ludeon Studios 2018) or *SimCity* (Maxis 1989), the player projects emotions to the events and creates narratives that the game designers have not really prepared in the game.

The storyworld is very much in the interaction with the aesthetics. Here, the narrative is the parts of the story that actually takes place in the instance of playing the game—what is told by the game to the player, and which narrative the player

is choosing themselves. Through one or more traversals through the game, the player constructs in their mind a storyworld of the game—what happens outside the narrative, or what could have happened instead. What is the moral of the story. What is actually written as a narrative in the game by the game designers is often only a part of the whole game storyworld that the game designers have designed. The storyworld is to the narratives as the mechanics are to actions: The game may involve the rule of jumping over a pit, but the player may avoid all areas with a pit, and therefore the action of jumping over a pit never exists in a game, although it exists in the game as a mechanism.

If games exist to sell a fantasy, that fantasy is very often a power fantasy: the common wisdom is that players want to feel empowered and in control, able to exert their will on the game world in various ways (often violent, but not necessarily). Even a game like *Hellblade: Senua's Sacrifice* (Ninja Theory 2017), where you play as a woman suffering from a debilitating psychosis that is threatening to entirely eat her up, the player, in their moment-to-moment interactions with the game, is nonetheless living a power fantasy. The roots of power fantasy can be seen already in Huizinga (1955, p. 10): “Here we come across another, very positive feature of play: it creates order, *is* order. Into an imperfect world and into the confusion of life it brings a temporary, a limited perfection”. The nature of play allows us to exert power on reality. We can become, like in *Hellblade*, a skillful fighter that we in reality are not, and would have to struggle much to become, both in physical training and in issues of social acceptance. Games and play allow us to simulate things, and we are in control of the simulation—what is difficult and what is easy. “Play begins, and then at a certain moment it is ‘over’.”

Narrative can affect the game mechanics, but is not necessarily restricted to them. Narratives are used especially to transit the player between different sets of mechanics. In a game the player may first have their character walk on foot with the related mechanics and actions available to them, and then there is the narrative of entering the car, upon which the player is transferred to the mechanics and actions of driving a vehicle. However, also in games of war, for example, the move of attacking another unit also has its own narrative, even though it is just an application of the game rules.

Cognitively, a narrative plot is a significant part of the aesthetics. A well designed, solid yet exciting narrative plot evokes emotions in the players. The line between narratives and aesthetics is surprisingly perhaps the most vague in GEM. It is clear to see that distinct sensory stimuli are not the same as the narrative.

### *8.3.3 Aesthetics and Sensory Stimulus*

As Niedenthal (2009) notes, the study of games tend not to be familiar with the whole brevity of what is meant by aesthetics. Aesthetics is not only about “eye candy”—about being pretty and shiny. Aesthetics could be easiest to understand by considering its antonym which is most familiar to us from the field of medicine:

anaesthetics—numbness, lack of senses and emotions. As the reverse of this, aesthetics is the whole field of emotions and cognitions experienced by the player during the gameplay. From an epistemological viewpoint, aesthetics studies the judgment of sentiment flowing from sensory inputs. Not just from a ludic player perspective, but also how game designers imagine and create virtual worlds. If a game designer fails in their quest for a synchronized (between themself and the player) aesthetic, they are likely to numb the player to the game's designed experience (or fantasy, in the case of the GEM) of overcoming interactable challenges. When this occurs, there tends to be a blurring of active participation in favour of spectating a narrative (watching a movie with you as player in it), making the aesthetic experience of player and spectator indistinguishable. If done right, aesthetics becomes the most direct channel for a game to present itself to the fantasy of the player.

Presenting a game as a truly pleasing aesthetic experience is less forgiving, than say, a painting. Games are digital systems where audio, visual, and haptic (three out of the five classical senses are available) output is available to the designer with the further complication of the player's goal-oriented desire to win. How to create a visual scene that represents game states in a way that is pleasing and not boring, repetitive, or clumsy becomes a precarious balancing act.

Murray (2012) states that "any medium serve three nested processes: inscription, transmission, and representation". This structure can be found in the GEM. Sensory stimulus is equivalent to inscription. It is the immediate sensory interaction between the game user interface and the player, such as the sounds and visuals presented by a game console, or the game pieces of a board game. From a GEM perspective, mechanics and storyworld are the catalyst for representation, in that these form the bi-focal lens on the game world the designer provides the player. Together, this lens and the inscribed sensory stimuli transmit aesthetics.

Aesthetics intrudes into storyworld and mechanics. A great storyworld is coherent and suitably rich, but at its most dull, it reduces to a flowchart. Aesthetics arise from the tensions in the story, and how the story is presented to the player. For instance, a horror story typically has different visuals and music styles than a comedy.

The challenge for the storyworld is to generate a great story. Although there is an essential fascination in amassing points or beating time limits, a digital game can benefit greatly from a great story connected to these play-drivers through fluent representation, with all the moves between the start and the end of the game as part of the story. As Niedenthal (2009) notes, the concept of aesthetic does not only include the sum of the player's sensory input but also the emotions and the state of mind caused by the experience.

Aesthetics is something that can be objectively put and found in the design. The evoked emotions are all subjective. This, of course, partially includes the action and narrative, but the most direct influence lies with the sensory stimuli from the game interface devices. The graphics, music, sound effects, haptic output, and other possible sensory stimulus mechanics convey to the player the results of their own actions, the narrative of the game, and hopefully the cognitive, aesthetic

experience intended by the game designers. Aesthetics and sensory stimuli provide the representation for the other elements.

## 8.4 Comparing the GEM with Other Models

In this section, we compare five earlier models to the GEM. Our intention is to clarify how they relate to the GEM and point out the limitations of these models.

### *8.4.1 Smed and Hakonen*

Smed and Hakonen (2003, 2017) define that the anatomy of a game is as illustrated in Fig. 8.4. The model includes five subjects: players, rules, goals, opponents, and representations, and seven relationships between them, forming three aspects of a game. Here we relate these subjects and relationships with the elements and faces of the GEM model. This analysis is also presented in Table 8.1.

Smed and Hakonen found their model on the player as an element in the design. The GEM does not see the player as an element of design, but rather the design exists between the players and the game designers. The player perceives the game mostly through the player face of the GEM, interfaced through the player’s actions, stimulus, and experienced narratives in the game.

Rules are the direct equivalent of the GEM mechanics. Goals, as components that “give arise to conflicts and rivalry among the players” should be divisible between goals included in the mechanics as victory conditions, or in the narratives as

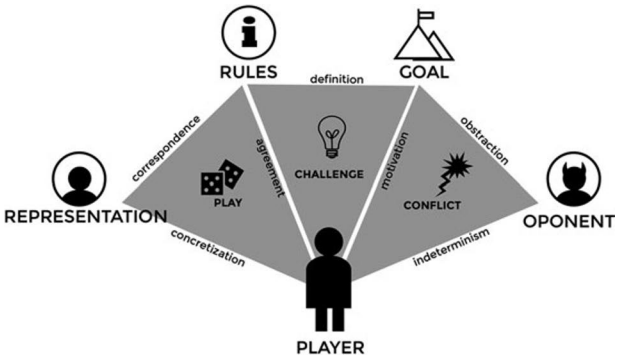


**Fig. 8.4** The anatomy of games as perceived by Smed and Hakonen

**Table 8.1** A comparison of the model by Smed and Hakonen to the GEM

| Smed and Hakonen | GEM | Comment |
|---|---|---|
| Representations | Sensory stimulus, action | The sensory stimulus and player action are the concretizations that "represent the abstractions used in the rules" |
| Rules | Mechanics | Direct equivalence |
| Goal | Mechanics, narrative | "Goals give rise to conflicts and rivalry among the players". GEM perceives this in the enabling mechanics and motivating narratives |
| Opponent | Mechanics, narrative | The opposing unpredictability is either included in the mechanics, or delivered through the narrative |
| Player | – | The game experience occurs, when a player interacts with a game. The GEM is the anatomy of this experience |
| Definition | Mechanics | Within the mechanics, the rules define the goals. The narrative can easily get involved here and interfere with the rules |
| Agreement | Action | "[The players] agree to follow the rules". The action is, how the player executes their part of the mechanics and their agency |
| Motivation | Mechanics, narrative | Motivation is essentially the same as goals |
| Correspondence | Mechanics, sensory stimulus | Both models agree that the sensory stimulus/representation must correspond with the mechanics/rules |
| Concretization | Sensory stimulus, action | Smed and Hakonen perceive that the "representation concretizes the game to the players". In GEM the concretization occurs through the action and sensory stimulus |
| Obstruction | Narrative, action | As the player is more obscure in GEM than in Smed and Hakonen, the obstruction comes through, either the narrative of the fictional NPC opponent, or the action of the player opponent |
| Indeterminism | Narrative, mechanics | Indeterminism in GEM is due either the narrative (which does not have to be constrained by the mechanics) or due to the rule in the mechanics, where a die can be rolled, or another player may take alternative actions |
| Play | Dynamics face | Abstract rules correspond to real-world objects, and the game is concretized to the players |
| Challenge | Simulation face | The story explains the reasons for the challenge posed by the initial setting, eventual goals, and the rules/mechanics in between |
| Conflict | Theatre face | The narrative of the opponent (and the player) creates an exciting conflict |

story motivated goals. Even, when described by the narrative, the goals are, indeed, defined by the game mechanics.

Motivation is a complicated term. Essentially, the game experience as a whole is what motivates the player to play the game. In Smed and Hakonen’s model, the motivation refers more to the motivations that the player has for their actions within the game, which differs from the concept of goals only in nuances and in perspective. Goals are pulling the players towards themselves, whereas their produced motivations can be seen as pushing forces. Motivations are internal feelings in the players, whereas goals are external targets for these feelings. Looking through GEM, one should see that the players are motivated to play by the elements of the storyworld and the aesthetics of the game, but in some cases also an interesting game mechanics can motivate gameplay. In the game, the players agree to comply with the game mechanics, as well as creating narratives jointly with the game.

As challenge comprises of the player attaining the goals in accordance to rules, it would be equivalent to the “simulation” face of GEM. This is compatible, considering that the challenge as such does not involve aesthetics directly. The challenge can connect to aesthetics through the narrative that sets the goals for the challenge, or the actions the player needs to take to achieve the goals.

The hidden opponent that obstructs the player can also be a part of the game mechanics as a random factor. Some people have a dislike to chess, for example, as the game does not provide enough random factors in the game mechanics, but the opposition comes all from the other player directly. Most often, as in the case of chess, the opponent is part of the narrative—the actions taken by the characters in the game world. A good opponent brings indeterminism to the game and obstructs the player from achieving their goals. The conflict of the game in GEM can be seen through the theatre face, created together with the narratives of the game setting, and emotions evoked by the aesthetics of the form of the narrative—good vs. evil, and the excitement of all of the schemes on both sides.

The game activity is represented for the player through sensory stimulus, and basically also through the player’s actions. The sensory stimulus concretizes the game mechanics and thereby needs to correspond with them.

The play activity that is connected to the representation takes place in the dynamics face, where the narrative is only at the background, motivating the play. This is the concrete part of the play—what really happens when the game is played. The GEM model also recognizes the Huizingian child play, as seen from the theatre face, where the exact rules and mechanics are not so important, and a conceptual play, seen from the simulation face, where the aesthetic representation is not so important.

### *8.4.2 Björk and Holopainen*

Björk and Holopainen (2004) focus more on the design of how a game is played than how it is built. They state that their aim is not “to formulate a definition of

what game or play is", as there are several existing already. They aim at describing patterns of different observable phenomena observed during activity that people are calling gameplay.

Björk and Holopainen divide their discovered components into four categories: holistic, boundary, temporal, and structural. The holistic quarter, in particular, investigates the contexts of the gameplay, rather than the game itself. The GEM excludes this part, as it is something that is not built within the game. If a game was sent in a time capsule 500 years in the future, the players' contexts would likely be quite different, but the GEM elements would follow with the game. The GEM elements of the *Iliad* are still the same, even though the audience experience certainly is different, due to the changes in the context.

Foremostly, Björk and Holopainen describe a library of design patterns for games. In addition to the patterns printed in the book, it comes with a CD that contains even more patterns. The concept of design patterns has been adopted from the field of traditional architecture, through the method of Gamma et al. (1995) who implemented design patterns in software architecture as a part of the agile movement in the 1990s.

When it comes to gameplay experience patterns that Björk and Holopainen (2004, p. 206) describe, the closest that come are the *immersion patterns*: spatial immersion, emotional immersion, cognitive immersion, and sensory-motoric immersion. Not surprisingly, these four names sound similar to what we have in the GEM.

- Spatial immersion: "the result of extensive manoeuvring in the game world in real-time games and can sometimes be felt in movies". This is the "being there" type of immersion, where the player is presented the game world as a place where they are, and the player can experience the sensations of being there. In the GEM, this falls under aesthetics, where the player is emulated with fictitious sensory experiences of the game world.
- Emotional immersion: "obtained by responding to the events that characters are part of during the unfolding of a narrative structure and is similar to the immersion that books, theatre, or movies provide". This description would place emotional immersion into the storyworld element, but by the name, emotions arise only partially from the stories, and mostly from the representation—the death of a character can be presented comically, as well as tragically.
- Cognitive immersion: "based upon the focus on abstract reasoning and is usually achieved by complex problem solving". This is equivalent to the GEM element of game mechanics.
- Sensory-motoric immersion: "result of feedback loops between repetitious movements players make to perform actions in the game and the sensory output of the game". Although the sensory part of this title suggests the influence of sensory stimulus, this is most significantly about acting and reacting with the proper timing and cognition, which places this pattern into the action element.

### *8.4.3 Hunicke et al. (MDA)*

The framework of Hunicke et al. (2004) sees three lenses all on the same telescope, one after another. The game developer is looking at the game from the direction of mechanics, through which the dynamics of the gameplay can be seen, and the aesthetics is visible behind both of them. The player experiences primarily the aesthetics of the game, finding the dynamics of the game through it, and can perceive the game mechanisms behind both.

Projected in the GEM, the MDA model would appear to be gazing the game experience from the point of view of aesthetics, towards mechanics, seeing the bottom layer (stimulus, narratives, and action) between there as “dynamics”. “Dynamics describes the run-time behaviour of the mechanics acting on player inputs and each others’ outputs over time” (Hunicke et al. 2004), which is highly similar as the lower circle in the GEM manifesting the instantiation-during-gameplay of each higher-level element of the design. This analysis reveals that MDA is observing a game strictly as a game, through the dynamics face, ignoring the story part of the game, except where it is seen as connected to the game mechanics, or in the aesthetics.

- Mechanics (game mechanics in the GEM): “describes the particular components of the game, at the level of data representation and algorithms”. Also, this is the design counterpart of “rules”.
- Dynamics (action–stimulus in the GEM): “describes the run-time behaviour of the mechanics acting on player input and each others’ outputs over time”. Also, this is the design counterpart of the “system”.
- Aesthetics (fantasy and aesthetics in the GEM: “describes the desirable emotional responses evoked in the player, when she interacts with the game system”. Also, this is the design counterpart of “fun”.

Robson et al. (2015) argue towards using the word “emotions” directly instead of “aesthetics” leading to a MDE model, which has been connected to the OCC model by Mullins and Sabherwal (2018). However, we prefer the term “aesthetics” as emotions are individual and context-dependent and cannot be directly designed in the game.

### *8.4.4 Ermi and Mäyrä (SCI)*

The SCI model of Ermi and Mäyrä (2005) is very close to the GEM model. The main differences are that: (1) The GEM model observes the three elements both as top level conceptual designs, and as instantiative user experiences. (2) The SCI model has been discovered from the context of Communication and Community in Digital Entertainment Services research project (Järvinen et al. 2002, Sect. 4.1).

The SCI model is positioned within the social context of the player, which is not considered in the GEM.

The SCI model is named after its three main dimensions:

- Sensory immersion in the SCI model is achieved through the audiovisual execution of games. As such, this is the same as the sensory stimulus in the GEM, including other stimulus, such as the force feedback, and more recently the full mixed reality experience.
- Challenge-based immersion is achieved when the challenge and pacing is just perfect for the player, assumably in accordance to the flow theory, as discussed by Järvinen et al. (2002, Sect. 4.1). This dimension is closest to the GEM element of action, and strongly related to the mechanics.
- Imaginative immersion involves the use of imagination and enjoying "the fantasy of the game". In the GEM this involves the storyworld, which is the player imagined universe of the game built on the explicitly presented narrative.

Later on Mäyrä (2007) has renamed "imaginative immersion" as "mental immersion" without any other changes to the model, except for placing it inside a more thorough framework of contexts. As with the holistic category of Björk and Holopainen (2004) that is highly similar, we exclude the contextual framework from our model.

The components Ermi and Mäyrä (2005) mention related to the SCI model in the conception of the gameplay experience can be fitted in the GEM as well (see Table 8.2). The *interface* between the player and the game applies sensory stimulus as output and action as input. The rules of the game are a part of the mechanics, where the actions are derived from. The SCI model distinction between challenge-based immersion and rules is relative to the distinction between action and mechanics. The story is the narratives the game tells the player, but rather than the story, Ermi and Mäyrä (2005) perceive that the player's imagination is immersed to the more holistic fantasy of the storyworld of the game, using their own imagination and empathy towards the characters.

### *8.4.5 Adams*

Adams (2004, 2013) identifies three forms of immersion that are somewhat similar to the SCI model, but seem to lack the aesthetic form:

- Tactical immersion is the immersion in the moment-by-moment high-speed action. This form is related to the dynamics of the MDA model, in the connection of sensory stimulus and action. As described by Adams, we would rather see this form mostly involving action.
- Strategic immersion is the form "seeking a path to victory", focusing on winning the game according to the rules. This form is equivalent to the immersion through the GEM mechanics element.

**Table 8.2** A comparison of the model by Ermi and Mäyrä to the GEM

| SCI model | GEM | Comment |
|---|---|---|
| Sensory immersion | Sensory stimulus | Sensory immersion is “related to the audiovisual execution of games” |
| Challenge-based immersion | Mechanics, action | Challenge-based immersion “is at its most powerful when one is able to achieve a satisfying balance of challenges and abilities [...] related to motor skills or [...] strategic thinking” |
| Imaginative immersion | Storyworld | Imaginative immersion involves “the fantasy of the game” |
| Interface | Sensory stimulus, action | User input and output |
| Rules | Mechanics | Rules are a part of the mechanics |
| Story | Narrative | The story that is told by the game |
| Space | Mechanics | Storyworld in GEM contains the universe of the game. The game mechanics limit how much the player is able to see of the universe, and is part of the narrative that gives a finite glance to the infinite storyworld. The game space of chess is the $8 \times 8$ board, thus limited by the rules/mechanics, but the storyworld of chess consists of all the game boards of all the famous and less famous games of chess ever played, as well as all the stories people have about why the black and white king and queen are there with their armies |
| Meaning | Aesthetics | |
| Motivation | – | |
| Motorics | Action | |
| Cognitions | Aesthetics | |
| Emotions | Aesthetics | |

- Narrative immersion is identified by Adams as the one of the three to be present in books as movies as well as in games. Because the tactical immersion requires player action, it is not present, as such, in these “earlier” forms of art. This is unlike the sensory immersion in the SCI model, which, as the aesthetic element of the GEM, can be found in movies, and especially in movies as well. Narrative immersion connects to the GEM element of narratives.

### *8.4.6 Summary*

Table 8.3 collects all the analysed models and compare them to the GEM. *The six elements of the GEM seems to be a sufficient set in the sense that by removing any of them from the experience ceases it to be a game.* This impossibility comes in two forms: (1) Although, it is technically possible to take mechanics and action from a

**Table 8.3** A summary of the comparisons

| GEM | Smed and Hakonen | Björk and Holopainen | Hunicke et al. (MDA) | Ermi and Mäyrä (SCI) | Adams |
|---|---|---|---|---|---|
| Mechanics | The limits of the game that also cause the conflict and rivalry | Abstract reasoning and complex problem solving | Mechanics | – | What the player focuses on |
| Action | Concrete gameplay | Feedback loops of the gameplay performance | Dynamics | Satisfying balance of challenges and abilities that "can be related to motor skills or mental skills" | High-speed action |
| Storyworld | The unveiling of the actions of the hidden opponent | Participated events related to the unfolding of a narrative structure | Aesthetics | Use of imagination and empathy towards characters | – |
| Narrative | – | – | – | – | What the story audience focuses on |
| Aesthetics | Concrete gameplay experience | The feeling of being inside the game | Aesthetics | The audiovisual execution of the game | – |
| Sensory stimulus | – | – | – | – | – |

game, but then it is no longer a game, as the player has no role in it. (2) There can be no action without sensory stimulus, which necessarily creates aesthetics, whether it is thoughtfully designed or not. Also, if a game has action, game mechanics, and aesthetics, then the gameplay necessarily forms narrative, whether it is scripted or not, and a storyworld appears by necessity of the circumstances.

## 8.5 Sample Case Games

In this section, we present two brief examples on how the GEM can be used in analysing a game.

### *8.5.1* XCOM

*XCOM* (Firaxis Games 2012) is a recent game in the *X-Com* game series. It has quite clear game mechanics, being a turn-based strategy game. The characters can, for example, be commanded to shoot at a target. The game mechanics then involve a random number to be generated and compared against the calculated probability of the shot hitting or missing. If the shot hits, the game engine has several alternative animations to play to represent the hit to the player. This can be tested, by saving the game before a shot, and then executing the shot over and over again, by reloading the saved situation. As *XCOM* provides protection against “save scumming” (Hogarty 2013), the game mechanical outcome of the shot is each time the same, but the engine varies between the different representations, as they are not essential for the game outcome, and can be freely randomized each time.

Shooting is clearly also a part of the narrative, as it is an understandable action taken by a human-like game character. Like the mouse clicking action connects shooting to the mechanics, the narrative of shooting gets connected to the storyworld, where the war is taking place between humans and aliens, and hi-tech weapons are discovered and used.

The visual representation of the shot confirms the action and mechanics for the player, generating a sense of agency. The same representation also visually and aurally tells the narrative to the player, and provides the aesthetics for painting the storyworld to the player, promoting the suspension of disbelief. This all binds the whole experience together to the fantasy of the *XCOM* game.

### *8.5.2* Hellblade: Senua’s Sacrifice

Well designed aesthetics with well performed sensory stimulus can be used to replace actual game mechanics. For example, in the game *Hellblade: Senua’s*

*Sacrifice* (Ninja Theory 2017) the aesthetics pulls the player into immersion so deeply that in all scenes with fire engulfing the play area, an actual player character damaging mechanism is not necessary, or even as effective in providing the player with a sense of emergency and the need to hurry.

Yin-Poole (2017) remarks that, unlike the game lets the player to understand, the game does not end, if the character dies too many times. The game represents as a visual mechanics, a rot on the character's arm that spreads every time the character dies and is restored to a previous situation. The player is made to believe that if this rot reaches the character's head, the game ends and has to be started over again. Apparently, this is not truly the case. The player can keep on failing and having the character to die over and over again. The rot will not spread past the character's shoulders. However, the effect, once again, gives the player a sense of significance for each death. Although the permanent death of the character is not in the program code, it is scripted into the beliefs of the player. An effect that almost goes beyond what "suspension of disbelief" covers. It provides for a great balance between helping the player to take each attempt seriously, and yet allowing the player to fail during the narrative.

*Hellblade* weighs heavily on aesthetics, although it has clear and functional mechanics, action, storyworld, and narrative too. The game puts the player inside the mind of the main character: the character hears speaking voices in her head, which is represented directly to the player through the speakers. Although the voices, as a mechanic, inform the player about the narrative in the game, they most essentially create the feeling of being a character in the game.

## 8.6 Conclusion

In this chapter, we presented the GEM (game experience model) which aims at providing a holistic view into the various aspects present in games. The GEM is intended as a tool for analysing games by recognizing their features through the various faces. It also provides aid for the game designer to inspire the creative process. The contribution of this work should be to help the game development industry to be able to analyse the content of their games and the human resources in relation to each other. Also, when designing something such as artificial intelligence for games, these four segments pose clearly distinctive challenges.

The GEM is composed of the summary of several game designers' and game researchers' formulations. It is based on the study of games, and hence best fitting for game experience. However, digital games are a subclass of digital applications, and thereby the GEM is applicable on a more general area as well. For serious digital applications, the storyworld is the business environment where the application will be used, for example, a corporate organization or a study life of a student.

Future work is needed in using the GEM in analysing a broader array of games to further validate the model. Furthermore, the GEM might provide interesting insights to the existing player type models. One could perceive "the power player type" to

be attracted to the mechanics, “story player type” to the storyworld, and “immersive player type” to the aesthetics. This direction would also seem to point to a bridge towards the field of psychology begging the question why do people experience games in this way.

With the games becoming in increasing magnitude a form of art, the theoretical perception of games is changing. The theories need to be able to facilitate for this new position so that they can account for all essential parts of a game design. The GEM is a further step towards this direction—and perhaps to the Grand Unified Theory of games.

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## ARTIKKELI

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# Designing Terminal Encounters with Erikson and Kübler-Ross for Life Before Death

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**Abstract**

Designing digital interaction for people facing the end-of-life at an early or middle adult life is a challenging task. The user, who may be a person of similar age, culture and social status as the designers, is nevertheless living in a reality nothing short of alien to them. For the designer, approaching the users and considering their circumstances – their reality is extremely stressful.

A theoretical framework is built to help the designers. Two psychological theories that address the end-of-life have been fused together through the Grounded Theory paradigm. The first theory is the Erikson's Stages of Psychosocial Development, focusing primarily on the ninth stage. The second theory is the Kübler-Ross's Five Stages of Grief, taken in her original, non-sequential manner describing a person's grief over their own demise (preparatory grief) rather than more general grief.

Co-Design, Agile and Design Science Research are brought together with this theoretical framework to assist the user to face their own death and to realistically appreciate that reality, which gives the designers solid ground on which to stand, when facing this ultimate application area.

The outcome is a framework of 13 categories of human desires at end-of-life, accompanied with conceptual ideas of how to meet these desires with digital solutions.

## Introduction

This paper proposes an initial version of a unified cognitive psychological theory for adult human mindset at the end-of-life. First, we introduce our motivations and background in this section. Next, we describe our research design in conceiving this new theory. Third, we present our grounding material in the two psychological theories by Erik and Joan Erikson and Elisabeth Kübler-Ross by analysing their content to prepare to fuse them together. The outcome is then presented in its own section *Synthesis*. Finally, we offer our conclusions, initiate discussion, and give consideration for our future interests related to this work.

### *Life Before Death*

Life Before Death (LBD) is a cross-disciplinary research initiative whose goal is "to design a digital artefact for adult people in a terminal stage of illness or injury to help them make the best possible out of the remaining life they still have." Thus, LBD is an item of thanatechnology – technology that guides us

on issues of mortality (Sofka 1997). Furthermore, it is a Reality Guide (Mäntylä et. al. 2014; Suovuo et. al. 2016) to help people understand their remarkably changed reality as they are facing death.

The LBD initiative will observe the perceived desires of a person at end-of-life from three directions: First, in this study, we derive a theoretical framework from two existing psychological theories that cover this area, approaching from the understanding of the human psyche and condition. Second, in a following study, we will investigate the experiences of practitioners of palliative care and other people with expertise and practice in the area, drawing upon what these people have actually observed in practice. These two results will be combined. Third, as we begin the co-design process, we will involve the primary source, the people at end-of-life themselves.

"Adult" in the goal definition refers to people of approximately 20 to 60 years of age, which is compatible with the range of Erikson's theory's life stages 6 (young adulthood) and 7 (adulthood) (Cesario et al 2010; Darling-Fisher and Leidy 1988). This range has been chosen as the initial target of the LBD initiative, because they are of age to make their own decisions, and still generally too young to have typically started considering their own mortality. The primary goal of the LBD initiative is a public digital service that improves mental health and quality of life, in particular at end-of-life.

Because the majority of the authors have a Nordic background, it is natural for us to see the Nordic-born co-design as the methodology for designing and constructing LBD. Our more exact methodology of co-design is as described by Sanders and Stappers (2008). Co-design is useful when the outcome should be as close to the eventual user's reality as possible. We combine Co-Design with design science research (DSR) (Hevner and Chatterjee 2010), and agile methodologies (Beck and Andres 2004; Sutherland and Schwaber 2013). Both co-design and DSR state background theories as a vital element. Also, the agile methodologies lean towards knowing and following the best practices. This is our motivation for coming up a single unified psychological framework for the purpose of the LBD initiative.

### *Review on the literature on the end-of-life psychology*

Our research focus has been in the area of palliative care. Palliative care precedes hospice care, but the length of hospice care is typically so short that lengthier processing of psychological crisis is not essential there, rather than facing more acute circumstances. Hence, we conducted a rudimentary literature review on Web of Science Core Collection[1], using the search terms "palliative" and "psychology" to be found in the abstract.

To gain some understanding on the most current topics in end-of-life psychology and grief, we took 30 most "relevant" articles, as estimated by the database, and searched them for citations relating to psychology and grief. Citations referring to each paper's authors own earlier work were excluded as this would have made these author's citation count excessive. This search came up with references to both of our theoretical sources, Erikson once, and Kübler-Ross twice, which confirms that these are still relevant sources. It was also not surprising to find Maslow's Theory of Human Motivation be cited in two papers. Overall, the resulted in 108 references with 273 authors. I. J. Higginson was cited in 3 publications, J. Addington-Hall, N. I. Cherny, D. Clark, R. L. Fainsinger, P. K. and J. Huggard, A. H. Maslow, G. Rodin, C. Seale, D. Spiegel, M. L. S. Vachon and C. Zimmermann in 2 each.

Higginson et al. (2007) investigated the needs of the patients in palliative care and discovered the

1 The search was conducted with the editions: Science Citation Index Expanded (SCI-EXPANDED)--1900-present, Social Sciences Citation Index (SSCI)--1900-present, Arts & Humanities Citation Index (AHCI)--1975-present, Conference Proceedings Citation Index – Science (CPCI-S)--1990-present, Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH)--1990-present, Book Citation Index – Science (BKCI-S)--2009-present, Book Citation Index – Social Sciences & Humanities (BKCI-SSH)--2009-present, Emerging Sources Citation Index (ESCI)--2015-present, Current Chemical Reactions (CCR-EXPANDED)--1985-present, Index Chemicus (IC)--1993-present, As accessible by the University of Turku.

need theories of Maslow and Bradshaw as proper explanations for the findings. Khan, Gomes and Higginson (2014) continued this empirical study of the patients' needs, gathering data and creating a new theory rather than leaning on existing big theories. With Sarmento et al. (2017), Higginson focused on studying palliative care at home, discovering such arrangement fulfilling a widely expressed need by the patients.

When surveying the close acquaintances of people who had died in 1990, Seale, Addington-Hall and McCarthy (1997) applied the typology of awareness contexts by Glaser and Strauss, relating it to Kübler-Ross. Like Higginson, Addington-Hall studied, with Hotopf et al. (2002) and Lan Ly et al. (2002), the causes of depression in end-of-life circumstances of advanced disease. The finding of the study was that research needs to be done. Addington-Hall also does not refer to any grounding theory.

Clark (1999) shortly discussed Kübler-Ross's theory, while focusing on expanding palliative care's approach of pain more towards "total pain", including "physical, social, emotional and spiritual elements." Fairsinger with Thompson et. al. (2009) interviewed patients of palliative care to analyse their level of acceptance of their prognosed demise and compare it with their reported symptoms. As with Addington-Hall, Fairsinger also cites Glaser and Strauss's *Awareness of Dying*, and Kübler-Ross's *On Death and Dying*.

Instead of depression and pain, Rodin and Zimmermann investigated death-related anxiety with Vehling et al. (2017). They also referred to their earlier paper (Rodin and Zimmermann, 2008), where they analysed psychoanalytical theories, including Erikson and Kübler-Ross. Ten years later, they continued their work with An et al. (2018), still referring to Kübler-Ross's theory. During this work they have come up with their own CALM-method for helping with the anxiety (Nissim et al. 2011).

Spiegel et al. (2007) combined psychology to the palliative care of patients with terminal breast cancer. Their approach is developed in their Supportive-Expressive Group Therapy, where they studied the therapy's effect on prolonging the life-expectancy of the patients.

## Research Design

The question that leads medical doctors, particularly in the palliative field, is: "Will this treatment improve the patient's quality of life?" This is a question to which an engineer can relate. Yet, how does one measure in LBD what is improvement and what is not? A solid set of indicators are necessary, so our research question must be:

*RQ: What is the taxonomy of desires of a person during life before death?*

Figure 1 depicts a diagram of three classes of desires within the space of all possible desires. RQ searches qualitatively the area of the desires of a person during life before death. This provides for a means of quantitatively measuring the cumulative sum of the mismatch vectors between that space and the space of desires provided for by the LBD service.

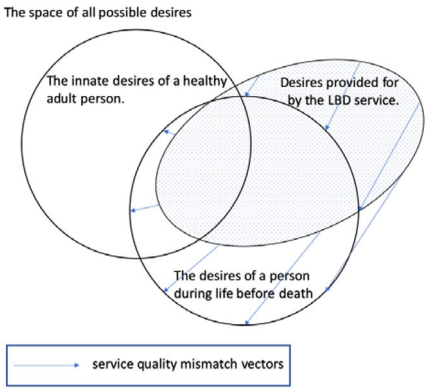


**Figure 1.** The offset of the taxonomy of desires of a person during life before death and the taxonomy of desires provided by an instance of the digital LBD service.

We followed the principles of Straussian Grounded Theory (GT) (Bryant and Charmaz 2007; Virnes 2014), taking our source material from two established theories – their defined categories, explanations and examples. Erikson's theory considers a person's psychological growth from birth to death (Erikson and Erikson 1998). Kübler-Ross's theory

considers how a person faces the crisis of death (Kübler-Ross and Kessler 2005). While aware of the critique further discussed in the next section, we find these two rooted in empirical clinical study, conducted by far more qualified people than we as computer scientists would be.

We first analysed the theories to construct with sets of thematic categories for both, relating to the research question. This analysis formalized the theories into "checklists", where each item should be identifiable as a phenomenon that could be check marked, when observed in user behaviour. The checklist for Erikson's theory consists of the attainable strengths and the conflicts and ritualisms involved at each stage. The checklist for Kübler-Ross's theory consists of the five stages and certain detailed features of these stages. This analysis process is described in more detail in the next section separately for both theories.

The constructed categories were then compared together and aligned, so that any equivalent categories could be merged together. Initially, two of the authors studied the checklists and came up with their proposals for alignment. They then met, compared the proposals and came up with a single initial fusion. During the following three months, in-between other work, the authors studied the connections with the theories to propose adjustments. The proposals were discussed and executed.

Eventually, we found good matches between Erikson's strengths and Kübler-Ross's stages, as well as between Erikson's conflicts and the detailed features of Kübler-Ross. Erikson's ritualisms did not seem to align well with anything on Kübler-Ross's theory, so they were omitted from the fusion.

## The two background theories and their critique

Our chosen theories were Erikson's stages of psychosocial development (Erikson and Erikson 1998), and Kübler-Ross's five stages of grief (Kübler-Ross 1997), which both are still widely referred in the scientific literature. Furthermore, they are the ones with which the authors of this paper are best familiar, and consider as the most thoroughly focusing works concerning approaching death.

The theories face a lot of criticism in general (Miller 1989), particularly for being related to, or a direct part of, psychoanalysis, which remarkably fell out of popularity from the way of behaviorism in 1913 (Watson 1913). While these critiques are valid, most can be ignored, as the focus of this study is on categorizing of different types of typical desires rather than trying to explain their root causes. The aim is also not to generate a psychiatric treatment for people, but rather build features that resonate with their reality.

One criticism towards psychoanalytical theories is that they "shift the goal posts" when trying to be approached and questioned. They do not make strong predictions that could be clearly falsifiable (Grünbaum 1977). Thereby, the theories are often not considered as strong psychological theories to explain the development and behaviour of a person. Yet, support from among the psychologists, such as Miller (1989), promote the application of theories from psychoanalytical, behavioural, as well as neuro-cognitive era, jointly as well as separately, as they each provide some clarity of vision upon issues that have not been adequately addressed. Thus, we find as an important part of this work is to boldly establish "goal posts" – the indicators, to provide tools for quantitative examination of accomplishments.

Another criticism towards these theories is if they can be generalized outside the cultural contexts from which they were derived. For LBD, this is not a problem either, as the target area of the initiative is at least initially confined into the same general culture, where these three theories have been built.

### *Erikson's stages of personal development*

Erik and Joan Erikson created a theory of stages of psychosocial development (Erikson and Erikson 1998). This theory is still seen valid and applied in studies involving crisis and even death (Cesario et al 2010). The theory, particularly as extended by Joan in 1998, considers the life of a person from birth to death as a series of stages, where each stage is a period of growth accompanied by a conflict to resolve. In a study on women with ovarian cancer, Cesario et al. (2010) observed how the worries of the patients tend to align with the stages of Erikson's theory, where

each patient should be in their given age.

Most studies involving the ninth stage of Erikson's theory seem to consider the life of elderly people, nearing the age of their statistical life expectancy. For our purpose, studies such as Cesario et al. (2010) are inconveniently rare. Rather than the typical study that observes how to identify and resolve the conflicts in the eighth and ninth stages, our question is what happens when death is approaching during the sixth or the seventh stage. Does such situation cause the "ninth stage" to begin immediately, skipping over the remaining in-between stages; or does it call for hurry to resolve the remaining conflicts, so that the ninth stage can be begun; or does it make it impossible for a person to complete the ninth stage that should help them approach their death? If the ninth stage begins immediately, will the person tackle the ninth stage versions of conflicts, or will these remain excluded too from the ninth stage?

Where Freud, according to Erikson, considered all parts of the person's mind being complete upon birth and only growing, Erikson based their theory on the embryological fundament of "epigenesis". In epigenesis, everything is built on their origins in the seed, not initially being formed to serve their eventual purpose (Erikson and Erikson 1998, 27).

Erikson mentions "gerotranscendence" as the final developmental advancement in the ninth and last stage. This advancement differs from the earlier eight stages, as in the ninth stage the challenge involves all the eight earlier challenges, except that what earlier was considered as the initial assumption (the syntonic quotient) and what was considered as the challenger (the dystonic element) appears now as the opposite. For the first developmental stage, where assumed trust was threatened by mistrust, now a person has found themselves in mistrust and will have to perceive what can still be trusted – what hope there prevails. Whether a person being pushed from a stage earlier than eight to stage nine will first face these challenges from syntonic quotient to dystonic or not, the challenges still would appear to be the same (Erikson and Erikson 1998, 107).

The significant features of different stages are repeated in Erikson and Erikson (1998) in three occasions. They are convened in a chart (Erikson and Erikson 1998, 38), discussed throughout the text, and again reiterated in the section concerning the ninth stage. One of them is the two sides of the psychological crisis/conflict. Second one is the attained basic strength. The third one is the ritualism involved in the stage. For each stage, these three features were chosen for the Erikson's checklist of relevant issues of a (dying) person, as shown on Table 1. These were each accompanied with "a goal post" description of how the feature would possibly present itself on a person.

**Table 1.** The Checklist for Erikson

| | **Virtue/Strength** | **Conflict** | **Ritualism** |
|---|---|---|---|
| 1 | Hope | Trust vs. Mistrust | Idolism |
| | *Mentioning of possibilities of the future* | *Mentioning of things that one can trust. Aversely, mentioning of fears.* | |
| 2 | Will | Autonomy vs. Shame/Doubt | Legalism |
| | *Expressing one's own opinion on thing, particularly related to one's medical treatments* | *Confidence on issues, particularly on one's medical treatment. Doubt, puzzlement or even shame, particularly related to one's own medical treatment.* | *Holding unyieldingly onto rules and details* |

| | | | |
|---|---|---|---|
| 3 | Purpose | Initiative vs. Guilt | Moralism |
| | *Considering one's effect on other people's life* | *Asking questions and taking other initiative and generally being pro-active, particularly in one's medical treatment. Apologizing for one's own condition.* | |
| 4 | Competence | Industry vs. Inferiority | Formalism |
| | *Recognizing one's own capabilities, particularly in taking care of one's medical treatment.* | *Properly conducted tracking of one's condition. Frustration of not accept-ing/understanding the prescriptions of caretakers. Feeling like being treated and handled rather than involved.* | |
| 5 | Fidelity | Identity vs. Identity confusion | Totalism |
| | *Considering one's responsibilities towards one's family and career.* | *Considering one's role within family and society.* | *Totalization of the world image.* |
| 6 | Love | Intimacy vs. Isolation | Elitism |
| | *Judging things by one's own taste and preference.* | *Confiding things to people within intimacy. Confiding things to one's own self alone in isolation. Fear of abandonment.* | *Marked more by snobbery than by a living style.* |
| 7 | Care | Generativity vs. Stagnation | Authoritism |
| | *Expressing concern over other people's wellbeing* | *Generatively providing care and answers to others. Stagnatively providing judgement over other people's activities.* | *Ungenerous and ungenerative use of sheer power for the regimentation of economic and familial life.* |
| 8 | Wisdom | Integrity vs. Despair | Dogmatism |
| | *Studying and expressing understand-ing of particularly one's own treat-ment and circumstances. Observing the circumstances (of others) at the moment and after one's death.* | *Recognizing integrity in one's own life and its consequences, or despair in dissatisfaction over one's life and its consequences.* | |

### *Kübler-Ross's Stages of Grief*

In 1969 psychiatrist Elizabeth Kübler-Ross released her ground-breaking book *On Death and Dying*, detailing her observations of and work with termi-nally-ill patients as they deal with the end-of-life (Kübler-Ross 1997). Literature on grief labels this type as preparatory, which describes grief from the perspective of the one who is dying. This contrasts with acute grief, which is experienced by survivors after someone has died. Anticipatory grief can be experienced by both the dying and survivors as they prepare for an impending loss. From the outset Kübler-Ross's observations were grounded by both pastoral and medical concerns, as her framework de-veloped in an interdisciplinary seminar that includ-ed both theological and medical students. Through her observation of over 200 patients at various stages in terminal illness (pre-diagnosis until hours of life left), she developed her five stages of grief.[2]

These stages of grief assume that the patient has

2 Kübler-Ross was not the first to develop these five stages of grief, but she became the most well-known. See the critiques in Parkes (2013) and Bregman (1989).

a fear of death, and that modern approaches to death aim to extend life, no matter what the outcome of that life may be. Modern medicine and technology have attempted to mitigate the grief, shame, guilt, anger and rage that naturally constitute the grieving process. Those grieving impending death are seen on the outside because of the double-taboo: the first being over displaying these emotions in a semi-public space, and the second is in dealing with death itself (the quintessential taboo of modern Western culture).

Kübler-Ross notes attempts at fleeing from or denying death is compounded by death's increasing "gruesome" nature, caused by it being "more lonely, mechanical, and dehumanized" (Kübler-Ross 1997, 8). The compartmentalization and professionalization of medicine has deteriorated the relationship between the patient and the doctor, where the former is treated more as a thing rather than a person, where cries for "rest, peace, and dignity" are met with more tests and medications. Kübler-Ross's paradigm for grief is an attempt to counter this trend and attend to the emotional needs of the dying.[3]

One issue that must be acknowledged with Kübler-Ross's paradigm is that it has been interpreted as both descriptive and prescriptive, almost to the point of limiting other possible stages or phases leading to death (Bregman 1989; Corr 2015). It is important to note that in her original paradigm, the stages of grief are only descriptive; some of her later followers attempt to prescribe the stages, in a linear manner, to all who are grieving. Such an approach is counter to Kübler-Ross's original thought and has had disastrous results with the grieving being implanted with guilt for not completing the stages exactly. She also argues that the stages can be cyclical, overlapping or happen in a different order.

Kübler-Ross's paradigm is also not absolute, meaning that grief does not necessarily follow as she described.[4] For the purposes of the study, her paradigm provides language that concretizes the experience of grief, putting words to thoughts and feelings that may seem indescribable by one who is actively dying.

For many the first reaction to news of a terminal illness is denial, which is the first stage in Kübler-Ross's theory. She notes that this reaction is "a healthy way of dealing with the uncomfortable and painful situation with which some of these patients have to live for a long time" (Kübler-Ross 1997, 39). This denial originates from the unconscious mind believing that all are immortal and thus incapable of dying. In her observations of patients, this stage is often temporary as a defence mechanism that is eventually replaced by partial acceptance. This denial is usually accompanied by isolation. Such isolation can be caused for two reasons. First, the dying person can avoid others in order to reinforce denial, as external people could "break" the fantasy that the dying person has established. Second, others may avoid the dying person out of frustration or a misplaced sense of helping the dying person cope with grief.

Kübler-Ross identifies the second stage as anger, but it could also take on the characteristics of "rage, envy, and resentment" (Kübler-Ross 1997, 50). The individual who encounters these emotions tend to direct them externally to family, friends and medical professionals, such that all the people connected with the dying person cannot do anything correctly. For this reason, this stage of grief is one of the most understood. As she notes, "maybe we too would be angry if all our life activities were interrupted so prematurely; if all the buildings we started were to go unfinished, to be completed by someone else ... what else would we do with our anger, but let it out on the people who are most likely to enjoy all these things?" (Kübler-Ross 1997, 51).

The crucial form of interaction at this stage is respect and understanding, listening to the concerns of

3 It is important to note that emotions differ based on culture and context and thus require a caregiver to go deeper than the one-word emotional label of each stage. See Bregman (1989).

4 Kübler-Ross's use of the word "stage" has made most readers think sequentially. Her colleague Carl Nighswonger (1972) described the process of grief as a "walk" through several dramas. A decade later, William Worden (1983) reframed the grief process as a series of four "tasks" that could be embraced or rejected.

the dying patient that underlie the angry emotions. The goal of this interaction is to affirm that the dying patient is still a human being, valuable and worthy of being cared for, and allowed to function.

Anger can also originate from losing control of one's life decisions, especially for individuals who are accustomed to having control over other aspects of life. Dying often means giving up such control, either because of physical limitations or because family takes away such control in self-governance.

Kübler-Ross defines the third, lesser-known stage "bargaining" by stating that "if we have been unable to face the sad facts in the first period and have been angry at people and God in the second phase, maybe we can succeed in entering into some sort of an agreement which may postpone the inevitable from happening" (Kübler-Ross 1997, 82). She sees this move from anger to bargain as a parallel from childhood development, when a child asks for a favour after expressing anger does not get the desired result. Experience has taught the dying person that good behaviours of some sort can be rewarded, even if it is to temporarily postpone pain, the loss of ability, or even death.

In the fourth stage, the loss of control and function is coupled with the anger potentially caused by distanced family and friends caused in the second stage, which leads the dying person into a state of depression. Kübler-Ross identifies two types of depression that occurs at this stage. The first is caused by past loss, which can include financial or employment loss caused by the illness, change in family roles because of decreased ability, or a combination of the two. This type of depression is often accompanied by guilt or shame.

The second is caused by impending/future loss. "When the depression is a tool to prepare for the impending loss of all the love objects, in order to facilitate the state of acceptance, then encouragements and reassurances are not as meaningful" (Kübler-Ross 1997, 87). Kübler-Ross notes that this type is usually silent, which requires caregivers to provide verbal cues to assist the dying person to emotionally prepare for what is ahead.

Hopelessness is an emotion that is often central during this stage of grief. Caregivers want to resolve this problem by giving hope, even to the extent of false hope. Such false hope will make things worse since it prevents the dying person from progressing to the final stage of acceptance. The key is to provide authentic hope while being truthful about what is to come. False hope may bring the dying person back to the second stage of anger.

Kübler-Ross notes that a dying person who has had enough time and support to go through the previous stages of grief should be able to arrive at a place of acceptance.[5] She emphasizes that this stage is not equivalent to being happy or as everything has come to conclusion; rather, it is a time that is "almost void of feelings" (Kübler-Ross 1997, 113). For this reason, this stage is often characterized by more nonverbal communication instead of verbal communication. Kübler-Ross's observations note that many patients at this stage stay in silence and are appreciative of quiet encounters.

Some patients will attempt to fight until the very end, which family and friends may seem as a laudable, but it actually makes it more difficult for patients to reach acceptance, which hinders dying with peace and dignity. Kübler-Ross states that "those patients do best who have been encouraged to express their rage, to cry in preparatory grief, and to express their fears and fantasies to someone who can quietly sit and listen" (Kübler-Ross 1997, 119).

Patients who are terminally ill at a younger age (and thus have not gone through Erikson's stages of the life-cycle) will need more assistance going through the stages of grief. Kübler-Ross observes that those who have died at the stage of acceptance (and thus without fear and despair) take on a quality of early infancy, a phase of passivity in which nothing is asked of them.

These concepts are convened in Table 2.

5 Here, it is important to remember that the stages are descriptive, and Kübler-Ross's language here has led some to read them as prescriptive. More helpful for this study is that she emphasizes the need for time before being able to come to acceptance.

**Table 2.** The Checklist for Kübler-Ross

| **Stage** | **Feature** | **Indicator** |
|---|---|---|
| 1. Denial and Isolation | Temporary disconnection from reality | Expressing doubt over whether the current situation is real or not. |
| | Belief that self is immortal and incapable of dying | Expressing lack of responsibility over risks in one's actions. |
| | Avoidance of others to reinforce denial. | Avoiding contact with other people, such as caretakers and relatives, who would cause one to admit the current situation. |
| | Caregivers isolate dying because of frustration or discomfort | Being avoided by others due to them having experience or just fear of one persisting on denying one's own circumstances. |
| 2. Anger | Dying person feels that life has been interrupted/disrupted prematurely | Expressing dissatisfaction over one's life being cut short. |
| | Outward directed (delivering emotions towards others without receiving any feedback) | Expressing negative attitudes towards others, not thinking of one's own self. |
| | Loss of control | Expressing sensations of not having control of one's own life and circumstances. |
| 3. Bargaining | Attempt to postpone the inevitable | Taking any and all means to prolong circumstances. |
| | Depending on "good behaviour" to be rewarded by extended life | Attempting to improve one's ways of life, in effort to help the circumstances. |
| | Asking favours from the universe | Prayers. Donations to medical research. |
| 4. Depression | Looking to the past<br>i) Financial loss<br>ii) Employment loss<br>iii) Change in family roles<br>iv) Characterized by guilt or shame | Concentrating on loss of wealth and career positions.<br>Finding changes in one's role in the family.<br>Expressing guilt or shame in these losses. |
| | Looking to the future<br>i) Impending losses<br>ii) Tends to be silent | Contemplating future hardships.<br>Remaining passive and silent when discussing the future. |
| | Hopelessness<br>i) Caregivers attempt to give hope, even false hope | Expressing lack of hope for anything worth looking forward to in the future. Being patronised by the caregivers with vain or false promises of the future. |
| 5. Acceptance | Requires time and support | Expressed thoughts naturally not focusing on one's imminent demise alone. Smiles and other gestures expressing one's thoughts not being focused on one's imminent demise alone. |
| | Not "happy", but void of feelings | |
| | Primarily nonverbal | |

## Synthesis

Within this section we abbreviate Erikson as E and Kübler-Ross as KR. The two tables (1 showing E and 2 showing KR) are compared to each other to form the new framework.

Figure 2 shows the conclusion of how we identified connections between the lists. The connections between the main categories are marked with thicker lines, and the connections between smaller details with thinner. Colour coding has been used to mark the KR's categories to which the lines connect and dotting to help distinguish thinner lines of the same colour. The ritualisms from the checklist for E are not included in the picture, as their lack of correspondence to the checklist for KR became apparent during the connection work, and hence they were dropped out from the final model at this point. For clarity, the sub-features within KR's categories in this figure are not in the same order as in the checklist (and were originally on the whiteboard). They are reordered to minimize the overlapping of connecting lines.

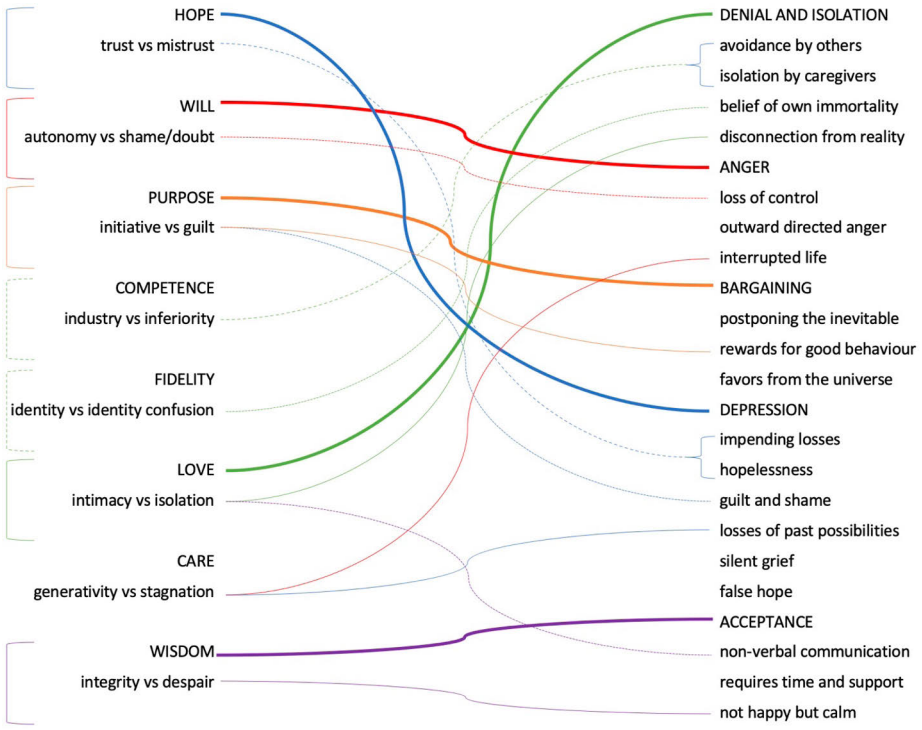


**Figure 2.** Connections identified between the two checklists.

The outcome of this work is 13 categories of adult human desires and behaviour relating to when approaching death, as shown in Table 3. The first five categories correspond with the five stages of KR as such (albeit in a different order), as well as the E's strengths that a person can be expected to gain during their stages 1–3, 6 and 8. Figure 3 demonstrates this structure.

**Table 3.** Categories formed by fusing together Erikson's and Kübler-Ross's theories.

| **Category** | **Erikson** | **Kübler-Ross** |
|---|---|---|
| 1 Expectations | 1.a Hope (1st stage strength) | 4 Depression, 4th stage |
| 2 Power | 2.a Will (2nd stage strength) | 2 Anger, 2nd stage<br>2.b Outward directed (anger) |
| 3 Worth | 3.a Purpose (3rd stage strength) | 3 Bargaining, 3rd stage |
| 4 Interruption | 6.a Love (6th stage strength) | 1 Denial, 1st stage |
| 5 Reasonability | 8.a Wisdom (8th stage strength) | 5 Acceptance, 5th stage |
| 6 Trust | 1.b Trust vs. Mistrust<br>(1st stage conflict) | 4.b, 4.c Impending losses and false hope (Depression) |
| 7 Control | 2.b Autonomy vs. Doubt<br>(2nd stage conflict) | 2.c Loss of control (Anger) |
| 8 Guilt | 3.b Initiative vs. Guilt<br>(3rd stage conflict) | 3.b, 4.a.iv "If only's"<br>(Bargaining, Depression) |
| 9 Involvement | 4.b Industry vs. Inferiority<br>(4th stage conflict) | 1.c Avoiding others<br>1.d Being excluded (Denial) |
| 10 Disbelief | 5.b Identity vs. Confusion<br>(5th stage conflict) | 1.b Disbelief (Denial) |
| 11 Presence | 6.b Intimacy vs. Isolation<br>(6th stage conflict) | 1.a Disconnection with reality<br>1.c Avoiding others (Denial)<br>5.c Non-verbal communication<br>(Acceptance) |
| 12 Heritage | 7.b Generativity vs. Stagnation<br>(7th stage conflict) | 2.a Interrupted life (Anger)<br>4.a Losing what one had (Depression) |
| 13 Serenity | 8.b Integrity vs. Despair<br>(8th stage conflict) | 5.b The calm acceptance<br>(Acceptance) |

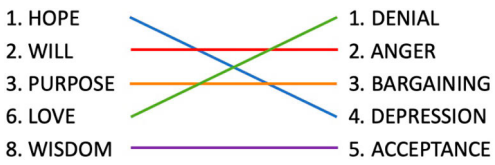


**Figure 3.** How the five categories of Kübler-Ross connect with five stages of Erikson.

Erikson's strengths in stages 4 (Competence), 5 (Fidelity), and 7 (Care) find no pair in KR's model, and are thereby excluded from the fusion. Competence could be perceived in the fusion category 9 (Involvement), but without a suitable equivalent stage in KR's theory, we perceive it more proper to take the conflict of this stage from E's theory. Fidelity appears difficult to see as a distinct from Will, Purpose, Competence, Care and Love, especially when trying to reflect it against KR's theory. Like competence, as there is not proper pairing for it in KR's stages, it was excluded from the fusion. Also Care fails to pair, and yet, we can find a match of the conflict related to each of these three excluded stages in KR's theory for the fused framework.

Interestingly, these excluded strengths all are social ones, unlike for example Hope (1.a) and Purpose (3.a), which can be experienced in solitary. Even Love (6.a) as Erikson describes its meaning in their theory, is considered primarily narcissistic. By consequence, we notice that Kübler-Ross focuses on more personal experience than shared experience. Even, when social interaction with other is mentioned, it tends to be from a negative perspective, such as false hope given by others, avoidance of others, and expressing anger towards others.

The categories 6–13 correspond with E's conflicts at each stage 1–8, as well as with the more detailed phenomena within KR's 5 stages. As both categories 1–5 and 6–13 are ordered according to E's corresponding stages, it is easy to note that 1–5 are similar to 6–8, 11 and 13. E's 1 stage connects to KR's 4, 2 to 2, 3 to 3, 6 mainly to 1, and E's final stage 8 to KR's final stage 5. E's strengths of stages 4 and 5 did not find a match in KR's stages, but their conflicts can be connected to KR's denial similarly as E's strength and conflict of stage 6, which could be interesting for any future analysis of E's theory.

The 13 categories of the fusion framework are as follows: expectations, power, worth, interruption, reasonability, trust, control, guilt, involvement, disbelief, presence, heritage, and serenity.

### *Expectations*

KR's Depression unintuitively connects with E's Hope. We call this category *expectations*. Erikson describes Hope as "pure future" and "expectant desire". It is based on either trust or mistrust of what is to come. Kübler-Ross's Depression comes after a person first denies the grief, then exhorts anger towards the grief, and then has attempted to bargain with the grief. At this point, struggling ends and expectation begins (Kübler-Ross and Kessler 2005).

Indicators for processing issues of the *expectations* category involve questions of what a person can yet expect from the future. From a bleak and depressed perspective, all is over and nothing else remains but death. On the opposite end, a person may shield themselves from their reality and make unrealistic plans. Making plans for the future are a significant part of this category, both in acceptance and denial of the real circumstances.

### *Power*

KR's Anger is primal power that is directed outwards without listening. This resonates with E's strength of Will, where expectant hope has made way to the personal will that is threatened by shame and doubt. The risk of facing shame and doubt easily inhibits the person from listening. KR's Anger could be said to be childish in E's perspective, as it connects to the infantile, second development stage. This *power* is active. It can be directed at oneself, but more importantly, it is seeking for contact with others.

The *power* category is indicated by the person expressing themselves without much control, or capability of receiving feedback.

### *Worth*

In E's theory, the stage for the development of Will is followed by the stage for the development of Purpose, and in KR's theory, the stage of Anger is followed by the stage of Bargaining. In our fusion, we match these two elements in the category called *worth*. A person is searching for their worth as they try to bargain for extra time, trying to understand the purpose of their existence, now that they are facing the inevitable end of it.

Unlike *expectation*, which is considering what will happen in the future, worth considers how much influence the person has on the future. A person should feel that they are needed rather than

useless. Also, unlike uncritical extortion of *power*, the person is trying to determine how the world responds to them. Indicators involve analysing what the person is still able to affect the world.

For a designer of digital interaction, the *worth* category relates to the concept of agency. (Murray 2012)

### *Interruption*

KR's stage of Denial resonates strongly with E's stage of Love, where a person is focused in their work more than caring for others – the care for others over narcissism is only at the latter two stages. This would appear visible in the conflict of this stage, where intimacy is placed against isolation. In KR's Denial, a person becomes isolated by their own actions and the reactions of people around them. These both match with the illusion of immortality – the analogy of life being an endless highway. *Interruption* is the initial form of discovering mortality at adult age.

*Interruption* is indicated by observations of observing things that have so far been a regular part of life, but now must be abstained, cancelled, or altered.

*Interruption* involves the change in *expectations*. *Interruption* may also lead to activities involved with *worth*, as the person notices what they are no longer capable of, or how their influence on the world has changed.

### *Reasonability*

E's eighth stage is about self-reflection and understanding that life begins to be over. KR's fifth stage is the Acceptance of the reality – not the kind of acceptance that the situation is good, but the kind that the person is not denying the reality. This fuses into the category we call *reasonability*.

*Reasonability* rationalizes expectation into a realistic balance, away from irrational extremes of nothing or everything being possible. It also reins *power* and submits it into starting to listen too.

### *Trust*

E's conflict between trust and mistrust aligns with the fears of impending losses in KR's Depression. We found *trust* as a suitable name for this category, as both sides of E's conflict of the first developmental stage are basically about trust – one directly, and the other as its opposite. Also, KR's described fear of impending losses can be rephrased as a question of being able to trust the future. This fear is further increased with the risk of caretakers providing false hope.

Indications of the *trust* category involve questions of believing in the expectations: confidence instead of doubt. Lack of *trust* may lead into worst cases of uncritical wielding of *power* or depressive lack of *expectations*. *Interruption* events may strain *trust* and lead into processing of *trust* issues.

### *Control*

E's second stage conflict questions the person's autonomic exhortations of will with possible shame and doubt of the consequences. This resonates with KR's description, that in the Anger stage a person exhorts their will against the reality of the situation and everything around it, leading typically not to a hoped outcome. The category composed of this connection is named *control*.

*Control* is indicated by the person making plans of action and successfully following them through. *Reasonability* and viable *expectations* are a prerequisite of *control*. The person must have *trust* in their *worth* and through them, exhort their *power* in a controlled, responsive manner.

### *Guilt*

As KR states, the person may have many "if only I"-thoughts of their past choices. This relates to E's Guilt as an opposing force to initiative. That again is also convenient for these "if only"-questions described as a part of KR's stage of Depression, where initiative is strongly suffocated (Kübler-Ross and Kessler 2005).

Indicators of *guilt* are reminiscing the past and contemplating one's past activities. *Guilt* is, in a sense, the opposite of *expectations*. The person may base their expectations partially on motivations of guilt, trying to fix things broken in the past, or at least make amends. *Guilt* may affect one's *worth*, for example through *interruption* of a past status.

### *Involvement*

Distinct from *power* and *presence*, we find *involve-*

*ment* relating to the conflict of industry and inferiority in E's theory. KR does not make such distinction inside the Denial stage. This is the person's will and possibility to be an active part of their medical treatment and a maker of their own life choices, rather than being just an object of others. It should be present as in the Anger stage, possibly intense during the Bargaining stage, less visible during the Depression stage, and stabilized at the Acceptance stage.

*Involvement* is indicated by functional interaction between the person and their caretakers. *Power, worth, reasonability* and *trust* need to be in balance for *involvement* to be possible. The person needs to have a proper sense of control, where they still are capable of listening and trusting the caretakers, and their own worth sufficiently. *Involvement* may be shattered with issues of *interruption*.

### *Disbelief*

In the Denial stage, KR describes in detail *disbelief*, which can be matched with E's fifth stage conflict between identity and identity confusion. The obtained roles are no longer functional in the new circumstances, which may lead the person to be troubled with wondering how to be, or just choose to ignore the change of circumstances altogether.

Indicators of *disbelief* are trying to find proper course of actions and behaviour to a situation that is new and where the person does not have a ready set yet. The person may be aware of their *worth* in the situation, even if they are in disbelief of how they should exhort this *worth*.

### *Presence*

Erikson's conflict between intimacy and isolation is connected to the isolation of KR's Denial, as well as E's eight stage conflict, but also to KR's Depression and Acceptance. As E describes, intimacy is contrasted with isolation when growing up because a person arrives with aims of intimacy that is threatened by isolation. When approaching death, in E's ninth stage, a person tends to arrive with isolation because friends and others having died and the person having retired from the daily work; or in KR's model, being abandoned and isolated in the stage of Denial, but the following stages eventually bring intimacy back to the person's life, as conflicts are successfully resolved. We name this category *Presence*.

*Presence* is indicated by a person considering the current circumstance. Pondering about how they are experiencing it. Also, the presence of others is an important part of this category. When uncritically exhorting *power*, a person is not fully experiencing the presence of anything else than their own self. *Involvement* may take place through *reasonability*, even if a person is not really sensing themselves present in the situation, especially if *disbelief* is elevated.

### *Heritage*

*Heritage* is a category where a person, according to E's theory, is concerned about their life's achievements, such as children, work and all they have built, which connects with KR's described feelings of interrupted life at the Anger stage and fear of losses at the Depression stage. What will happen to the person's life's work?

Indicators of *heritage* include the will for autobiographical work, as well as considering the issues of one's testament and final will.

### *Serenity*

*Serenity* is a state present in both theories as a final harmony and understanding of the situation. In E's theory, it is the person's sensed integrity over disgust, for the life they have lived. In KR's theory, the stage of acceptance is the calm, serene acceptance of reality and the ability to continue one's life forwards. Both theories conclude the development of events to this state, which sounds interestingly like "happily ever after" of fairytales. Yet, E states that person either becomes serene or desperate based on this conflict, and KR sees this state as something to achieve, rather than something to be granted.

*Serenity* is indicated by lack of open issues and lack of questions and troubled feelings. Kübler-Ross describes this as being almost void of feelings.

## Conclusion

In this paper, we answer the RQ with a taxonomy of 13 categories. This taxonomy categorizes the desires relevant at end-of-life stage, particularly when this stage occurs in the western culture, prematurely at

adult age. The taxonomy is a fusion of Erikson's and Kübler-Ross's psychoanalytic theories, with sample indicators that help identify to which desire any idea or question refers.

Essentially, the framework is expected to help the researchers in the design process to: 1) accumulate data showing how well the theoretical expectations match the reality, and if the theory itself should be corrected, 2) identify when the users and engineers have a potentially distorted idea of any given phenomenon, and 3) identify own researcher bias.

Looking at the first four rows on Figure 3, it is interesting to see how the two theories align symmetrically. The final stage in both cases is essentially the resolution of a situation. If one would consider *anger* and *bargaining* (also, *will* and *purpose*) sufficiently similar in order to be considered as a single item, then it could be seen like the process of going through grief along the path described by KR would be progressing deeper and deeper back to our most early developed characteristics of our personality as discovered by E. In other words, a person first faces the crisis with their most sophisticated personality through denial, but the magnitude of the issue penetrates through the layers, until the person faces *depression* with primal, infantile mechanism of pure *hope*, before *acceptance* and *wisdom* can be attained.

## Future Work

The earlier research on the psychology of the end-of-life period still relies on the big old theories from Freud, Erikson, Kübler-Ross and Maslow, although there is a lot of contemporary empiric research being done to form new theories. On our behalf, we have come up with a fusion of Erikson's and Kübler-Ross's theories from the perspective of end-of-life and invite dialogue.

With this initial theoretical framework now created in the rigor cycle of DSR, we are ready to proceed to the evaluation cycle with it, to confirm our findings empirically. However, we need to stop on our way there at the design cycle, where we apply the framework to come up with a design prototype for evaluation.

We also have another path to follow, as we intend to include Heidegger's philosophy more integrally into our framework. As notable in the reviewed existing literature, the denial building anxiety and depression are a central phenomenon in life before death. Heidegger (1927, §51–53) noted death is an event that we all must face that we should not fade away from our minds. If people want to make the best out of their remaining life, it is important not to deny death. Instead, people can take it as something imperturbable and anxious which offers a possibility for self-investigation that people tend to deny in their lives. This kind of being-towards-death (see more Heidegger 1927) can help people to understand one's prevailing life, likewise limitations and possibilities in one's remaining life. However, this kind of attitude is no easy task and may need the support that LDB is aiming to offer. We have planned this addition of a third theory for attempting to saturate our top-down GT work.

The LBD initiative may provide a possibility to evaluate the ninth stage of Erikson's theory, particularly in relation to people who would by their normal development be expected to be entering the eighth stage, or even earlier, rather than now finding themselves approaching the end-of-life due to their circumstances.

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**Tomi ”bgt” Suovuo, Jonas Kurlberg and Erkki Sutinen**

**A Hands-on Course on Co-design for Digital Theology**

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*Innovate Learning Summit Online 2021 - , United States, November 9-11, 2021*

# A Hands-on On-line Course on Co-design for Digital Theology

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**Abstract:** Digital theology is a new multidisciplinary field of study. An on-line co-design project course was organised in order to teach the field to a multicultural and multidisciplinary group of students. This was an experimental online project based learning course, combined with cultural variety, co-design, design science research, Scrum, Discord, Trello, GitHub and WordPress. The experiment tested the students, the teachers, the technologies, as well as the methodologies. The course succeeded with all the diverse elements working well together. The biggest issues were the quality of audio/video communication, Discord notifications, and the depth of teaching on digital theology.

## Introduction

One of the cultural changes brought by "the advent of the computer" (Murray, 2012) is the increase in multidisciplinarity. Especially with Open Science, the modern researcher has to "think outside the box" and look into the multidisciplinary research questions where the most significant discoveries are made today.

There is a growing interest in digital theology (DT) and community building initiatives such as the Facebook group "Global Network for Digital Theology". An online portal would further establish the community by providing, promoting and even publishing related material, as well as by promoting scholars in the field. The complexity of the task of designing the final form and functionalities of this portal in a fresh, innovative and inspiring way lead to the decision to apply modern digital interaction design principles.

Since the methodologies of problem based learning (PBL) and agile have often falsely been understood to ease the workload of teaching and engineering, they have somewhat fallen into disrepute. Teachers might be tempted to take shortcuts, leaving the students to solve problems on their own. Project managers might discard the importance of planning, jumping straight to construction. Conversely, proper PBL demands a high level of attention to the students in providing them with well prepared, individual feedback. Proper agility demands extensive thinking on the planning and testing throughout the whole project.

This paper discusses the lessons learnt from a PBL co-design project course in DT with a diverse group of faculty and postgraduate students from theology and computer science. The objective of the course was to teach the students new skills by designing a portal for the subdiscipline of DT through collaborating across disciplinary boundaries. The course ran from May to July 2021 and was accredited by the Department of Computing at the University of Turku.

## Research Setting

The research question of this paper is: How effective is the application of modern technologies[1] and modern working methods[2] for on-line[3] project course on digital theology[4] with a highly diverse group[5] of students?

The grammatical structure of the research question is such that it begins with the broader concepts and then descends into specifics, as depicted on Figure 1. The research setting is below described in the reverse order, where the description of the broader concept can be approached from the more narrow, deeper concept within.

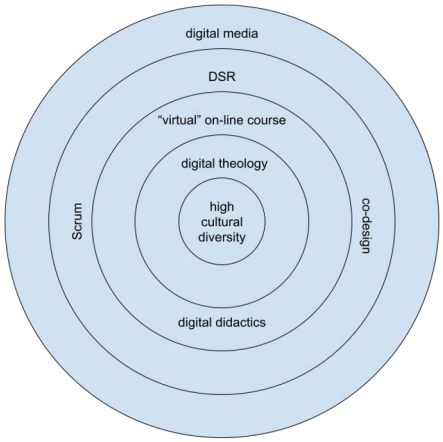


**Figure 1.** The hierarchy of the concepts in the research setting.

### Diverse Backgrounds

Teaching cultures vary significantly between different countries (Alaoutinen and Smolander 2010, Berglund and Thota 2014, Oudshoorn et. al. 2019). The initial set of students came from Canada, Ghana, India, Namibia, Nigeria, Ukraine, the United Kingdom, and the United States of America, while the tutors were from Finland and the United Kingdom. Thus, the fact that the cohort represented nine countries on four continents did pose some challenges.

Finding a time when all participants could meet synchronously was a considerable issue to resolve. Given the spread of timezones we settled for 14:15–15:00 (UTC+1) as the most suitable. There was also some confusion due to some countries practising the Daylight Saving Time.

1[] The technologies chosen were Discord, Trello, GoogleDrive, GitHub, Moodle and WordPress.

2[] The methods of the course involved Scrum, co-design and DSR.

3[] Normally courses such as this would be organised as a "summer school" on the University of Turku campus. Due to COVID-19 pandemic the course was moved online, which was beneficial as it permitted students from all over the world to participate.

4[] Project-based learning and PBL are both closely equivalent members of inquiry-based learning (Taajamaa 2017). We are here using the term broadly rather than referring to any particular brand of PBL.

5[] The students were from four different continents.

Further, the Scandinavian education culture focuses more on students individually experiencing and learning about the subject, whereas in Namibia, for example, the education tends to be more hierarchical with the teachers acting as active presenters and the students as passive recipients. This difference in outlooks was evident in the student interviews. In any case, the degree of student autonomy and feedback provided would likely have decreased with higher student numbers.

**Digital Theology**

Digital theology is an umbrella term denoting a multidisciplinary endeavor to explore the intersection between theology and information technology encompassing a range of perspectives, methodologies and approaches. Much of the literature to date has focused on digitally mediated practices within Christian communities and individuals. Overlapping with the socio-scientific orientated subfield of digital religion (see Campbell 2012) theologians have sought to understand and theologically assess the impact on digitalisation upon religious practices, identities, symbols and communities (e.g. Berger 2017, Siker 2017, Thompson 2016). Beyond the focus on religious practices, theologians have also constructively engaged with digital culture both by bringing theological concepts, such as divine sovereignty (Reichel 2019) or the incarnation (Kull 2001), to shed light on the digital and conversely by using concepts stemming from digitality to bring new insights to faith (e.g. Campbell and Garner 2016). Some thought has also been given to methodological questions, not least the use of methodologies deriving from digital humanities for theological research (eg Anderson 2018, Phillips et. al. 2019). Further, from questions of surveillance (Stoddart 2021), to transhumanism (Cole-Turner 2011), artificial intelligence (Herzfeld 2002), and social media practices (Ott 2019), there are also those who have sought to bring theological insights to societal, political and ethical issues arising from the digital revolution. Finally, more recently there has been a concerted effort to bring DT and computer science into a reciprocal conversation and with that also the attempt to bring a computer science perspective to DT (Sutinen and Cooper 2021). The co-design course can be seen as a showcase of such interdisciplinary collaboration work by bringing theological thought into the design process of the online platform, while using design models from within computer science to bring the project into fruition.

**Digital Didactics**

***Learning by Doing***

Project courses at University of Turku is common practise, involving actual business clients/partners and projects. A prime example of this are Capstone Courses (Taajamaa et. al. 2013), in which instead of working solely on abstract theoretical levels, seek to apply practical experiments. This is, however, clearly not the case everywhere in the world. Two of the students from computer science mentioned that this was the first time they did hands-on software engineering as a part of course work.

***Learning Diaries as Personalized Dialog Between a Student and the Teachers***

In addition to the project work tasks, the students submitted a learning diary every week. This was to take up 10% of the students' course work. The diary entries had two requirements: 1) provide a short summary of how the student had divided their weekly 20 hours; and 2) explain what the student learnt, experienced and noticed during the week. The students were also encouraged to ask the teachers any questions relating to the course. The teachers reviewed all diaries giving written feedback; encouraging students where they had doubts, and complimenting good and interesting ideas and achievements. With a low student number the workload was fairly light for the teachers. The value of such personal feedback is high, but the cost for the tutors is also relatively high, as a level of pedagogical skills and experience are required.

The learning diaries grounded the teaching process both for students and teachers. For the teachers the diaries provide concrete evidence of the students' course activity, as well as on a more abstract level, a sense of the students' learning. For the students the diaries was a place for self-reflection as well as confirmation by the teachers' feedback. Without the learning diary, the students could easily be left with a degree of uncertainty over whether or not they actually were learning anything useful and they would have been less motivated.

***Online Course Reality Guide as a System***

The concept of Reality Guides (RG) (Mäntylä et. al. 2014, Suovuo et. al. 2016) refers to applications that support our awareness of the reality we are in, be it actual reality, or fictitious as in augmented reality games for

example. What needs to be created for a virtual collaboration facility for a course like ours, is a RG that will serve two things: sustaining a Bandwidth of Trust (BoT) (Sitkin & Roth 1993, Rousseau et. al. 1998), and supporting a sense of presence.

Murray (2012) suggests that spatiality – a sense of "where" the user is in the system – is one of the four affordances of digital media. Nevertheless, creating shared digital spaces where this affordance also facilitates a sense of the presence of others requires more effort (Schroeder 2011). This spatiality, which Benford (1998) sees as a "third dimension" of shared spaces, is still shallow in practise, and as such creates a challenge to the BoT. In online spaces users are not able to meet in a fashion that, according to Rosseau et. al. (1998) builds relational trust.

It is conceivable that as digital technology develops, it can create hyper-awareness, where a person's awareness even exceeds that of natural face-to-face interaction. A digital system could, for example, detect the stress levels of participants in a meeting and display this as additional information on the user interface to help mutual understanding. This is an elementary future prospect in RGs. However, the currently available tools only narrow down the available modalities and thus decrease awareness.

Our RG was essentially provided by the Discord service, where transitions between asynchronous text chat and synchronous text, audio and video communication were made easy. Audio and video meetings provided a spatially strong sense of being together as well as the maximal boost for the BoT. In-between synchronous meetings, the text chat supported asynchronous collaboration, slowing down the decay of the BoT.

**Co-design, Agile, DSR**

When the final result is unclear at the outset, agile and co-design methodologies are particularly useful. Where the end-user's customs and culture are unfamiliar to the designer, co-design involves the end-users in the design process itself. They are the best experts on the required overall user experience. However, in a case of a new community, such as DT, the end-user is unfamiliar even to themself: the community is still in a process of discovering its make-up and identity.

In agile methodologies the design progress is constantly controlled. This means that the planning does not attempt to be completed in the initial phase of an agile project, as such predictions in practise often become less and less accurate the further the plans extend to the future. Rather, planning continues throughout the project. The first constructs are put together even during the first days. Some work may need to be undone later, but there exists the constant agility in changing the design, if during implementation and testing something turns out to be unfeasible. This suits well with co-design, as all participants have tasks to complete throughout the project.

The third design methodology that was implemented was Design Science Research (DSR) (Hevner 2007). DSR is an information technology research methodology where the targeted activity is fixed, but the tools of the activity are altered by a newly designed artefact. With its mechanics of altering between three activity cycles: relevance, rigor and design, DSR is very suitable for agile co-design.

**The Technologies Chosen**

Discord is a free platform with a good reputation. It was chosen for our video and audio conferencing as well as for text chat. Its design goal is to provide VoIP service for online game players, for whom it has become a favoured choice (Lazarides 2015). The asynchronous chat has also been well thought of for meeting the need of gamer communities to discuss and agree on joint game sessions among other things.

We had our own DT-community Discord "server" named "GNDT", where additional "channels" and "roles" were created for the course. There were five text channels: "#course-planning", "#course-announcements", "#course-discussion", "#implementation-discussion" and "#development-discussion"; and four voice channels (also including videoconferencing capability): "course-planning", "course-talk", "implementation-talk" and "design-talk". The two roles were "course organiser" and "course participant".

Trello was chosen as the kanban/backlog board for the scrum implementation. The Trello board consisted of 6 lists: "Being ideated", "Being DESIGNED", "Specified", "Being IMPLEMENTED", "Completed" and "Discarded". This was also the typical life-cycle of a feature in the process, except for the "Discarded"-list, where any feature deemed unfeasible was moved with recorded discussions for why it was eventually discarded.

Google Drive served as the platform where project documents were written and stored. It is currently the most convenient tool for collaborative authoring, not least as it is a free service but also for its excellent WYSIWYG-co-editing user experience.

GitHub was used as the central repository for the project. It is also a popular service with excellent usability and free of charge for small collaborative projects such as this. Further, in comparison to arranging temporary local university user accounts for the duration of the course, GitHub provides easy access.

University of Turku has dedicated systems for providing temporary Moodle user accounts for external course participants. An electronic registry of personal data, such as the content and the teacher feedback on learning diaries demands compliance to the European GDPR policies, which the university Moodle service provided us with. Another purpose for the use of the service was to provide credibility for the course, with a formal point of connection to the university.

WordPress was chosen as the base platform for the project. Although essentially a platform for blogs, it is a popular platform for a wider variety of websites, especially due to its high customizability through plugins.

## The Implementation of the Course

Before the first meeting the students were all instructed to acquire a Discord user account and join the GNDT-server. Discord was used for all of the synchronous video conferences, and it also offered an agile way to share information and answer questions – both in private messages, and more importantly in the public channels where all participants could benefit from answers given. The number of students was initially ten. Seven students continued halfway through the course and four completed it.

The project work was organised as a two-team Scrum project. We adjusted the specifications of Sutherland & Schwaber (2013) to our specific circumstances: with the course lasting a month and a half, a week was a reasonable sprint length. There were no daily scrums, due to the shortness of the sprints, the partial asynchrony of the work, different time zones, and the fact that the course was not a full-time activity for the students.

Every Monday a 45 minute sprint meeting was held, following the repeated agenda as shown in Table 1. Each week the participants stated whether they would be focusing on implementation or design team. Both teams were required to have at least two members, but participation in the work of the other team was also allowed, as long as the main focus remained on the chosen team. The design team would choose a set of ideated concepts and further conceptualise them into specifications for implementation tasks. The implementation team would choose a set of specified implementation tasks and implement them.

| | |
|---|---|
| 1 | What has the implementation team done last week? |
| 2 | What has the design team done last week? |
| 3 | What will the implementation team do this week? |
| 4 | What will the design team do this week? |
| 5 | Who will be in which team this week? |
| 6 | What is needed from the teachers? How is your course experience? |
| 7 | Learning diary discussion. |
| 8 | Any other thoughts and questions? |

**Table 1.** The agenda for the Sprint meetings.

The first meeting of the course lasted two hours. The first hour consisted of introducing DT and the practicalities of the course. The second hour was the first sprint meeting. During this meeting alternative platforms were discussed, but as proposed by the teachers, WordPress was deemed the most suitable to build on. The first task of the implementation team was to prepare the production platform. The design team had a set of initial ideas to develop. At any stage, all participants were invited to contribute and develop new ideas in the "Being Ideated" list.

The learning during the course can be conceptually understood to have taken place in the "thinking" sections of the diagrams in Figures 2 and 3 – and as an outcome of "watching", "informing", "inspiring", "thinking" and "contributing". This follows the general pattern of the academic study of unfamiliar phenomena. This also fits the higher levels in Bloom's Taxonomy of Learning (Bloom, et. al. 1956): Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. The three first levels typically concern teaching subjects already known by the students, whereas the three higher levels require deeper understanding of the subject, which cannot be given, but must be attained by their own thinking.

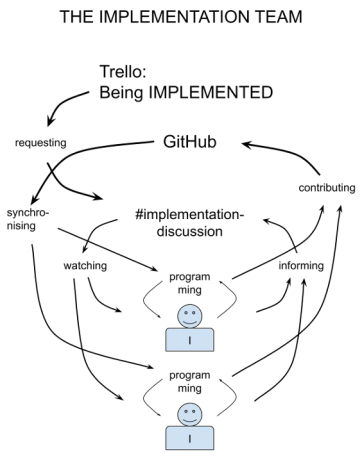


**Figure 2.** The working diagram of the implementation team

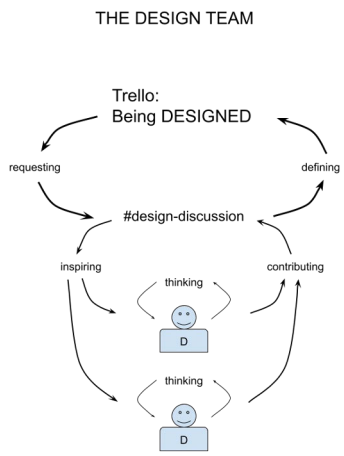


**Figure 3**. The working diagram of the design team

As illustrated in Figure 4, the design team worked on the DSR "rigor cycle", whereas the implementation team worked on the "design cycle". The full intent of the course, especially in relation to the co-design, was that the "relevance cycle" would come from the input from external customers, as well as from the course participants themselves as they themselves become part of the DT community.

**The Functionality of the Technology**

Providing access to the Moodle site, Google Drive, Trello and GitHub for everyone was straightforward whilst inviting people to start using Discord and join the GNDT server proved more complex, especially as the invites outdated relatively quickly.

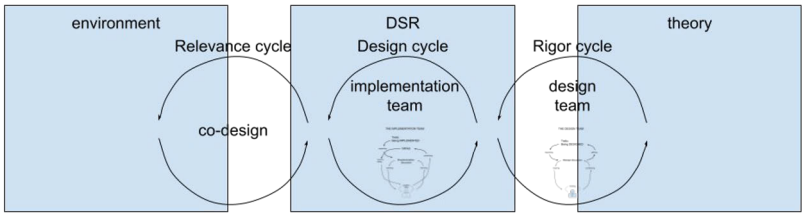


**Figure 4.** The application of DSR.

The videoconferencing in Discord successfully got the scrum work started. However, occasionally some participants were unable to transmit video or audio, including one of the teachers, due to bad connectivity. The video conferences were not recorded. Recording of video conferences is not promoted by Discord, and with the connection issues the quality of recordings would have been poor. Furthermore, recording the meetings might have further

dissuaded the participation of shy students. The main record of the meeting was instead the updated status of the Trello board, and a message on the Discord course announcements channel of who (students and teachers alike) were mainly committed to which team.

The primary working area of the design team throughout the week was the design discussion Discord channel. Ideally the summaries of these discussions would have been written as notes on the Trello cards, however this practice was not followed.

The central working areas of the implementation team throughout the week was the GitHub repository, together with the implementation discussion channel in Discord. The more experienced participants (again, both students and teachers) provided remarkable support to the more inexperienced participants.

Halfway through the course, additional synchronous meetings on Thursdays were agreed upon. Initially the idea was to provide the Design team an opportunity to have a focused discussion on the current tasks. Simultaneously the Implementation team started having a social get-together in order to provide further support for each other. With the low number of participants on the course, these two Thursday get-togethers ended up being a single joint meeting.

A significant problem with Discord was it's ineffective notification system. One student missed the notifications of some meeting announcements even with the announcements channel set up to notify everyone. Another problem was the real-time video connectivity between four continents, which was most likely an issue of the internet connection, rather than with Discord. Overall Discord served well as the main tool for shared presence and RG providing the means of maintaining the BoT.

Trello ended up being underused in relation to its full potential. It provided a solid service as a backlog for the project, but the cards mostly merely contained their titles. Trello has much more power for fostering ideas, but with the tools being new for everyone involved, there were few resources for mentoring the students to use them better. They were used, but not enough to consider the students to have really mastered them.

GitHub became familiar for those students who took part in the implementation activity. It was used to store PHP code and Docker configuration. For the Implementation team it was the second most intensively used technology after Discord.

WordPress was introduced to the whole course up to some degree. As one of the most used blog platforms, everyone had most likely heard of it before. The course provided the students with an opportunity to have a more detailed look at it, although the degree to which this happened varied from student to student.

Google Drive served a modest function, utilized as a shared location for two documents: The Design Document, and the Sustainability Plan. Moodle served its purpose for providing credibility and critical data privacy for the course.

**Learning Outcomes**

At the final sprint meeting we interviewed the students. One feedback from the students was that although they had benefited from learning technical skills, the theological aspect had not been considered sufficiently. Even though DT was the primus motivator for the whole initiative, it is true that learning the tools were prioritised. The greatest learning impact of the course was in how to do agile co-design with a cross-disciplinary team. This is a highly transferable skill for doing teamwork together with any group of people from different working and thinking cultures.

The course was delivered with the expectation that it would be a single instance, which would initiate the project. However, in a new iteration the dialogue between DT and the practical design and creation of the technology could more deliberately be continued throughout the course. Regardless of this expressed user experience by the students, it is reasonable to assume the project has given the students a sense of what it is to apply digital technology in DT. This assumption, however, is difficult to verify scientifically.

***Bloom's Taxonomy***

"Bloom's Taxonomy" (Bloom et. al. 1956) has been widely referred to when assessing the cognitive levels of teaching. It presents six levels: knowledge, comprehension, application, analysis, synthesis and evaluation, each higher and more complex than the previous level.

In relation to the course several concepts were introduced at the Knowledge level. Many of the tools were completely new to the students. For most students the field of DT was novel as well as the concept of a scientific community. The students increased their knowledge of the content and concepts, but most of the knowledge level

learning happened on the technology side. This learning was supported by the use of services, such as Trello and GitHub, as well as by the asynchronous nature of Discord, where discussions could be later read by anyone.

When a course applies a learning-by-doing pedagogy, Comprehension comes automatically. However, the risk of miscomprehension still exists. There was no final exam, so we could not assess the quality of the students' comprehension, except by observing the features that were implemented. The fact that these features were created are in themselves sufficient evidence that Comprehension did indeed occur. The students' disappointment in having not enough time given to discuss theology could be taken as a shortcoming of the course in failing to grow in their comprehension of theological ideas and concepts.

What applies for the Comprehension level, also applies for Application level. Due to the early stage of the project the application of technologies remained only remotely related to DT. Digital technology was applied by the implementation team, and the needs of the community of DT were discussed by the design team, but the gap between the two fields remained wide.

As for the three higher levels, the work of the design team revolved much around the essential questions of synthesizing the requirement specifications for the community of DT. The dilemma we had was that in effort to fully perform study on these levels, one should master the three lower levels. However, with a field as new as DT, we needed to do much work on these levels for a student to learn to know, comprehend and apply. Evaluation of instances of DT would, of course, require for all five other levels of the structure to be sufficiently complete.

## Conclusions

Our answer to the research question is affirmative. We found that the contemporary technologies and methods can be effective in delivering an online project course with a diverse student group, and can be a great learning experience for all involved.

Understanding the workings of WordPress was the biggest technological challenge, but we were fortunate to have one highly experienced student, as well as two somewhat experienced organisers. Individual user account registration and convening the study group in all services varied somewhat in their ease, but none provided serious issues. Scrum and DSR were easy to adopt and proved useful. The same could probably be said about co-design, although its actual presence is not so clearly evident. The mixture of cultures didn't manifest as a significant factor, although it might have hindered some students' participation due to pre-conceptions of teacher-students hierarchies.

One positive outcome of the course, indicated by the students' expressed wish to continue with the project, is that they felt empowered, motivated and supported through the course. For a clearer answer on the effects of the cross cultural engagement, a more indepth anthropologic study would need to be conducted.

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