Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Information Technology and Electrical Engineering
Department of Computer Science

Quynh Anh Nguyen Phan
Truc Anh Nguyen Phan

GDPR Staff Training in IT Companies: A Game-Based Approach

Master's thesis in Computer Science
Supervisor: Professor Monica Divitini
July 2020

NTNU
Norwegian University of Science and Technology

Quynh Anh Nguyen Phan
Truc Anh Nguyen Phan

GDPR Staff Training in IT Companies: A Game-Based Approach

Master's thesis in Computer Science
Supervisor: Professor Monica Divitini
July 2020

Norwegian University of Science and Technology
Faculty of Information Technology and Electrical Engineering
Department of Computer Science

NTNU
Norwegian University of
Science and Technology

Abstract

The General Data Protection Regulation (GDPR) is a regulation made in 2016 that aims to protect the data and privacy of EU and EEA citizens. The implementation of this regulation required businesses dealing with personal data with or within EU to create appropriate measures that will conform to the new data protection principles. One such measure is to include GDPR training for internal staff, to inform them about what the GDPR is and how to be GDPR compliant. The planning of this training proved to be difficult for many companies due to the vastly overwhelming content of the GDPR, as well as the lack of practical guidelines on the specific measures one can take to ensure GDPR compliance. Additionally, GDPR as a learning topic is complex and not very interesting. It is difficult to create engagement and interest in staff training with this topic no matter how relevant the GDPR may be.

This thesis delves into some of the challenges concerning mandatory GDPR training and explores the notion of using serious games as a training approach. There are two main focuses in this approach: identifying relevant game elements that could increase learning engagement, and integrating a serious game into existing organizational training. Both of these focuses are first examined through conducting a systematic literature review of how serious games has been used in corporate training and the subsequent integration. The results of this literature review added to the design of the serious game *GDPR At Work* which was developed and evaluated in iteration by both junior and senior employees alike.

The results of this research includes a list of game elements that can support learning and engagement in mandatory GDPR training at IT companies. The most effective game mechanisms to raise engagement as well as support learning was revealed to be realistic cases that the players can relate to, presented through interactive game elements such as dialogues with in-game characters. Other game elements that proved effective in raising motivation and engagement were identified to be map exploration and rewards through various means, such as achievements. These game elements were revealed through iterative evaluations of the game *GDPR At Work*, where its results can be utilized to create other serious games with the goal to support staff training.

Sammendrag

Personvernforordningen (GDPR) trådte i kraft mai 2018, og hadde som hovedformål å beskytte personvernet til EU- og EØS-borgere. Innføring av denne forordningen krevde at virksomheter som arbeider med personopplysninger med eller innenfor EU, til å innføre passende tiltak for å samsvare med de nye personvernreglene. For at alle i virksomheten både skal forstå behovene for og risiko knyttet til personvern og sikkerhet, var det nødvendig å innføre tiltak i form av GDPR opplæring internt i virksomheten. Virksomheten må selv finne ut hva som er relevant og hva den enkelte ansatte trenger opplæring i. Dette viste seg til å være vanskelig på grunn av det enorme innholdet i GDPR, samtidig som at det var en mangel på praktiske retningslinjer og rutiner for de konkrete tiltakene man kan gjøre for å unngå brudd på personvernforordningen. I tillegg er GDPR opplevd av mange som et uinteressant tema. Det er dermed utfordrende å kunne skape engasjement og interesse under opplæringen.

Denne masteroppgaven tar for seg noen av utfordringene rundt obligatorisk GDPR opplæring og utforsker muligheten om å bruke spill som et middel for opplæring i virksomheter. Oppgaven tar for seg to hovedfokus: å identifisere relevante spillelementer som kan øke engasjementet i læring, og hvordan et spill kan integreres i eksisterende opplæring i virksomheter. Begge disse fokusene blir først undersøkt gjennom å gjennomføre et systematisk litteratursøk for å utforske hvordan spill har blitt brukt og integrert i opplæring i dag. Resultatene fra dette litteratursøket utdannet utformingen av spillet *GDPR At Work*, som ble utviklet og evaluert i iterasjon med ansatte med ulike arbeidserfaring.

Resultatene fra denne forskningen inkluderer en liste over spillelementer som kan støtte læring og engasjement i obligatorisk GDPR opplæring hos IT-selskaper. De spillelementene som ble påvist til å være mest effektiv for å skape engasjement og samtidig øke læring viste seg til å være interaktive samtaler med spillkarakterer, samt bruk av realistiske situasjoner som spilleren kan relatere seg til. Disse spillelementene ble funnet gjennom iterative evalueringer av spillet *GDPR At Work*, der resultatene kan brukes til å lage andre spill med samme formål om å støtte opplæring av de ansatte i bedrifter.

Table of Contents

List of Tables

List of Figures

Abbreviations

DSR	=	Design science research
GDPR	=	General Data Protection Regulation
ESN	=	Enterprise Social Network
NPC	=	Non-player character

Chapter 1

Introduction

1.1 Motivation

The rise of the internet brings along with it the rise of social media and other networking services. In order to use these networking services, users are often asked to exchange their personal data. These companies collect these data and in return promise to bring the users better experiences. However, this data collection opens up the possibility for dangerous security risks that must be addressed. The Data Protection Directive (DPD) enacted in the EU in 1995 was not enough to ensure data protection. A big reason why it was gradually outdated was due to the directive not being mandatory, and many parties attempted to exploit it. This became a bigger concern in the digital age where the youngest age group of internet users only become younger and younger due to the accessibility of the internet. Children and teenagers are the most vulnerable to compromising their personal data as they lack knowledge and training in information security[1]. This can be a big problem as they could be giving companies access to more data than needed in order to use the different services. With the lacking data protection laws in place, this data could be used for reasons the users are unaware of.

To address this rising need for data protection laws, the EU replaced its Data Protection Directive (DPD) with new laws concerning privacy and data protection of its EU citizens. GDPR was enforced on May 2018, and required organizations to protect the collected personal data while providing proof about how that data was protected[2]. The GDPR applies to all types of businesses, from multi-nationals down to micro-enterprises. It also states explicitly the fines for violating certain articles, and describes up to two tiers of violations. If an organization violates multiple articles, it will be fined for up to the highest tier of violation, which amounts to 20 million EUR, or 4% of the firm's worldwide annual revenue

[1] NorSIS (2017). *Ungdom og digital sikkerhetskultur.* Tech. rep. URL: https://norsis.no/ungdom-digital-sikkerhetskultur/

[2] Dennis Dayman (2018). *What is GDPR and Why is it Important?* https://www.validity.com/what-is-gdpr-and-why-is-it-important/

from the preceding financial year, whichever amount is higher[3].

This new regulation does not only affect businesses, but also researchers alike. This is especially prevalent in areas that require collection of data such as the clinical and translational research areas (Chassang, 2017). This only proves the important impact GDPR has on all the different work fields and not only within the IT sector.

Many businesses has taken to include GDPR in their staff training programmes in order to avoid the heavy repercussion. There is an expectation that essentially all employees should have a basic understanding of the content of the GDPR and data protection even though the individual employee may not have to deal with personal data directly in their work. This leads to certain employees finding the GDPR training redundant, which can be amplified if they had no prior interest in the topic. A literature review performed in the previous specialization project revealed that there has been little work done on the field of how to make GDPR training more engaging in corporate training (Phan and Phan, 2019). This gap in literature could be due to the GDPR being a relatively new topic, and internal staff training was not something many companies would be willing to share details about.

This thesis's main focus is to explore the possibility of using serious games to increase employee engagement and interest while undergoing mandatory GDPR training. There already exists many different research done on the field of increasing motivation and engagement in a non-game context with the usage of games. These research apply different motivational theories such as Four-Drive Theory or Ryan and Deci (2000)'s Theory of Self-Determination. The application of such research have also been performed, an example being Perryer et al. (2016)'s research to enhance workplace motivation through gamification elements. This research will therefore also examine the practical application of a serious game in corporate staff training and identify a list of game elements that can increase employee engagement and learning that such a serious game could contain.

1.2 Context

This work is a master thesis for the Department of Computer Science at NTNU, the Norwegian University of Science and Technology. It continues from the work done on the topic of game usage in organizational training in the specialization project done by Phan and Phan (2019), and will present the research, design and prototyping of a game that will be created to support GDPR staff training at companies working with personal data. The main supervisor for the project is Professor Monica Divitini.

1.3 Research Questions

Serious games are digital games that are used for purposes other than pure entertainment. They could be used to educate, train and inform, and therefore could be expected to play an important role in corporate training. However, Riedel et al. (2013) revealed that this

[3]GDPR, Article 83

seems not to be the case even though it has been previously proven to be an important tool in supporting corporate training in the industry (Michael and Chen, 2005). Based on this, it can be concluded that using a game to support employees to learn GDPR can solve the existing problems related to the learner motivation that were previously identified in the specialization project (Phan and Phan, 2019). While not explicitly stated previously, the focus of the research has always been on serious games.

Following the previous research done in the specialization project, the main focus in this thesis remains the same. This leads to the same main research question, only slightly modified with more precision on the game type:

> **RQ1:** How can serious games be used in GDPR training of employees at IT companies?

The literature review identified several game genres and mechanics that can be used to increase motivation, engagement and learning. However, this knowledge alone is not enough to design a game for companies. Previous surveys by Riedel et al. (2013) have shown that the adoption rate of serious games in corporate training is still quite low, and their adoption remains a significant challenge (Riedel et al., 2014). Therefore, an important point to consider is how the game can be integrated into the company. Based on this, the following sub research question is proposed:

> **RQ1.1:** How can a serious game for GDPR training of employees be integrated into IT companies?

The idea of using serious games in this context came from the existing research that suggested employees consider corporate training to be "unexciting" and "boring". To answer this, Donovan and Lead (2012) explain the possibility of games being a potential solution to improve this point of view. This is due to the known properties of serious games that promotes learning and engagement. Therefore, the most important goal of the research remains unchanged, and the following sub research question from the specialization project is still relevant.

> **RQ1.2:** How can engagement and learning elements be used in a serious game to support mandatory GDPR training?

1.4 Research Method

Continuing from the specialization project (Phan and Phan, 2019), this research paper further incorporates the design science research methodology (DSR), this time focusing on the design cycle and the subsequent evaluations. Hevner et al. (2004) describe that the way to understand a problem domain and its solution in the design science paradigm is through building and application of the designed artifact. In this project, building and evaluating the designed game would, in accordance to the DSR, lead to a deeper understanding of the

problem domain.

Figure 1.1 describes the three cycles in the design science methodology. The relevance cycle, through creating requirements and field testing, brings to light information about the domain and its application. The rigor cycle adds information grounded in the literature to the knowledge base. This information can be used to design the artifact in the next and final cycle: the design cycle. This cycle describes an iterative process of creating, evaluating, and re-designing of the artifact. The result of the cycles is an artifact that can be used to solve the original problem.

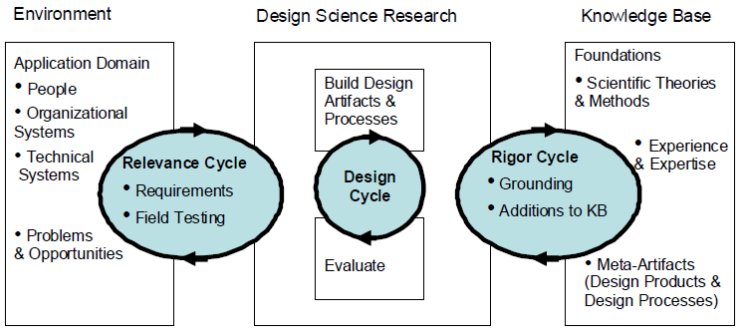


Figure 1.1: Design Science Research Cycles (Hevner et al., 2004)

This research, as mentioned, focuses on the iterative cycle of the design science methodology. The design of the game presented in chapter 4 is a result stemmed from the relevance and rigor cycle research performed in the specialization project. It is grounded in both the literature and the environmental information found from previously performed interviews with relevant employees in IT companies. The proposed game design is implemented in chapter 6, and with each evaluation seeks to expand on the possibility and effect of using serious games to support corporate training.

The proposed game design underwent three different iterations of re-designing and evaluations, which can be seen in figure 1.2. The first iteration was performed on the concept of a serious game *GDPR At Work* with wireframes described in chapter 4 on the game design. This evaluation was done with a group of students from NTNU with background on game development and design. This evaluation was done with the goal to improve the concept and design of the game in order to raise its quality before the final evaluation. The data gathering method used in this evaluation was group interview, where questions were asked after the presentation of the game in order to facilitate discussion between the participants.

In the second iteration, an evaluation with a game expert was performed. This evaluation was done on the first prototype of the game *GDPR At Work* that was developed after the concept evaluation. The game design divides the game into two roles—the learner and the trainer—in order to address the first sub research question on integration into IT companies. Only the learner's side was implemented in the prototype at this point, and a

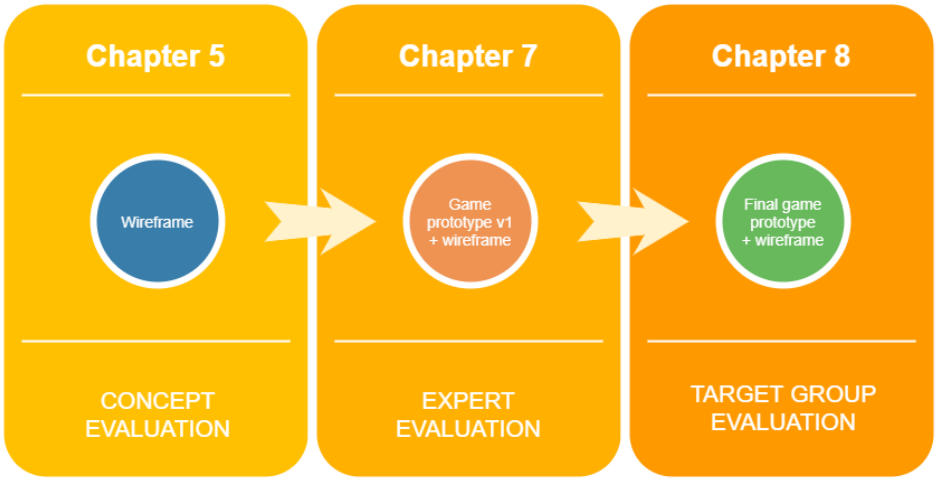


Figure 1.2: Iterative evaluation of the game

wireframe was therefore made on the trainer's side in order to receive opinions on both roles from the game expert. The method used was a semi-structured interview for this evaluation.

The final evaluation was performed with users from both the learner and trainer target groups. This evaluation was performed on the final prototype of the game, which reflected many changes from the evaluation with the game expert. This evaluation sought after qualitative feedback of the game, where both the learners and the trainers answered qualitative questions after playing through the game themselves. The trainer was also shown a wireframe of the trainer's side in the game in addition to the game itself.

All the evaluations performed resulted in qualitative feedback that was compared and analyzed in chapter 9.

1.5 Implications of COVID-19 to the project

The novel coronavirus COVID-19 was first discovered in January 2020 and led to many infection control measures that implicated the lives of many[4]. Rules regarding quarantine and isolation were enforced nationally and caused many implications for the implementation, as well as the evaluation of the project. The quarantine period that came as a result of COVID-19 limited access to the campus, thus limited hardware resources that could be used for the project. This limitation had a huge impact in various stages of the project, most notably the technology choices that could be used to develop the game. The technology choice chosen in the end also put a restrictions on what could actually be implemented.

[4]FHI (2020). Coronavirus disease - advice and information: https://www.fhi.no/en/id/infectious-diseases/coronavirus/

More information about this can be found in chapter 6.

Additionally, the quarantine period prevented the gathering of groups as well as restricted physical meeting, thus limiting the evaluation methods. All evaluation must therefore be done online. Lastly, the situation affected many industries and thus may have limited the availability of many employees. As employees at IT companies were the main target group, this had a huge impact for the final evaluation with the target group, where some of the employees contacted for the final evaluation could not participate, therefore affecting the results of the project.

1.6 Results

This research brings different contributions to the area of serious games applications in the workplace through different results. The first contribution is a description of a game design that can support IT corporate training. This game designed included game elements that have been found in the literature to be able to improve both player engagement and learning. These game elements were found from both the results of the literature review performed in the specialization project and the one done in this thesis.

Combining various findings, a game concept was developed and evaluated. From the game concept, an implementation and subsequent evaluations were done in this thesis. A main contribution in the thesis is the prototype of the serious game that have the potential to support GDPR training: the game *GDPR At Work*, in addition to the wireframe that illustrate the parts of the game that could not be implemented due to limited resources. The next contribution is the information gained from these evaluations—a set of recommended game elements that can increase learning and engagement in a serious game aimed to support corporate training.

The final contribution is the results from the evaluations of *GDPR At Work*. Previous research from the specialization project identified several challenges related to GDPR training, one such challenge was the opinions many employees have of GDPR, which cause them to consider the training to be a waste of time and generally have low motivation prior to training. The findings suggests that the serious games have the potential to support mandatory GDPR training at companies by raising engagement and motivation, thus potentially solving the challenge related to employees' motivation. It also has the potential to support the learning outcome of employees by employing various learning approaches that incorporates engaging elements.

1.7 Outline

Chapter 2 elaborates the problem and explains the reason behind this project by addressing the factors behind mandatory staff training at companies and how it can be improved using serious games. *Chapter 3* examines related literature about serious games used in training and explores how such games can be integrated into companies. *Chapter 4* de-

scribes the game design of *GDPR At Work*, a serious game designed to support GDPR training at IT companies. The game design and concept are evaluated through a group interview, which will be described in *Chapter 5*. The technical aspects are described in *Chapter 6*, with technology considered and final choices, the game architecture, as well as difficulties encountered during implementation. *Chapter 7* describes the evaluation with a game expert to discuss the game concept and improve the design. *Chapter 8* describes the main evaluation with participants from the target group. Finally, *Chapter 9* discusses the results of research, and *Chapter 10* presents the conclusion of the project.

Chapter 2

Problem Elaboration

Technology is transforming the world at a rapid rate. Privacy has always been an issue alongside the rise of technology. The world has come a long way since paper documentation. Digitalisation is happening in many services, affecting people of all ages in almost all aspects of their lives. From the elderly who did not grow up with technology, to the children with their first smartphone before starting education, these users have the same responsibility in data sharing as an Internet user. Data is being shared across all digital applications and services, and the duty to protect personal data not only lies in the users, but also the service providers.

To secure citizens of their data rights, several legislative counter-measures have been issued in many countries in Europe. The European General Data Protection Regulation (GDPR) is the most recent legislation that came into affect May 2018 with the intention to increase the protection of personal data in digital services. GDPR requires all data controllers and processors that handle personal information of EU citizens to comply with the law to protect data rights of EU citizens, or be subjected to huge administrative fines[1]. According to a global research by Dell (2016), 97% of companies did not have a plan to prepare for GDPR, at the same time only 9% of IT and business professionals were confident that they would be fully GDPR compliant by May 2018. Some of the biggest fines issued in 2019 include the fine proposed to be 183 million euro to British Airways, and more than 99 million euro to Marriott International (Macaulay, 2019). To avoid breaches, it is important to not only focus on GDPR implementation, but also on raising the awareness of how important GDPR is throughout the company.

To be GDPR compliant, it is mandatory for some companies that fit a certain criteria to train their employees in handling personal data. Therefore, all employees working at these organizations, irrelevant of their positions or roles, were expected to complete mandatory GDPR training. Due to the mandatory training in a topic not many would be interested in, employees may lack motivation and engagement before undergoing the training, thus may

[1] GDPR, Article 83

have a negative affect on the learning outcome. Serious games may function as an alternative to the training, as previous research has demonstrated the positive effect of serious games on both learning and motivation (Wouters et al., 2013).

The research conducted in this master's thesis strive to investigate how serious games can support mandatory corporate training. It aims to explore the possibility of serious games as an alternative to existing GDPR training that can engage and motivate the employees to learn about an uninteresting topic.

2.1 Challenges related to GDPR training

As GDPR is a relatively new topic, there is a literature gap on topics related to GDPR training. Previous research through the specialization project (Phan and Phan, 2019) examined how existing GDPR training are being done and identified several challenges that can arise during the process of planning such training.

2.1.1 Planning GDPR training

GDPR training is not mandatory in all organizations, but only in those with a designated Data Protection Officer (DPO). Only organizations that carry out processing or controlling of personal data on a "large scale" were required to appoint a DPO. These are typically larger companies, but may also concern smaller business if their core business revolves around data storage or collection. It is the task of a DPO to plan sufficient GDPR training to ensure compliance[2].

The regulation does not explicitly state what must be done or what the training should contain in order to comply with the regulation. It merely states that training must be carried out by all employees at the organization if it has designated a DPO. There are various sources that seeks to advice organizations on effective GDPR compliance strategy (Calder, 2016) (Team, 2017), but there are scarce materials that explicitly states how GDPR training should be planned and executed. The Norwegian Data Protection Authority (2017) provided a dynamic checklist with example training activities that Norwegian companies may refer to.

In the specialization project, an interview was conducted with several employees working at an IT company that already has GDPR training in place to further investigate how existing training is being done. According to the DPO, the training content was a product created by a cooperation between the DPO, a lawyer, as well as other GDPR experts. The GDPR is a relatively long regulation that is highly complex, and it can be challenging to narrow the content down to relevant parts that can be added to training. The process of identifying relevant requirements from the regulation that can benefit the company was identified to be one of main challenges in planning a GDPR training programme. This is mostly caused by the complexity and ambiguity of the regulation, and is a problem that

[2]GDPR, Article 39

require assistance from various experts to solve. The company ended up creating a basic training that would be mandatory for all employees, then developed additional training for employees with specific roles that may require more knowledge.

2.1.2 Interest and Motivation to Learn

Several employees who have undergone GDPR training were interviewed, and it was confirmed that employees have little interest in GDPR in general, unless the topic is related to their work. Out of the interview respondents, only the employee who have worked on a project with the goal to support a customer with GDPR compliance showed interested in the training. The other employees expressed that they did not see how the training could benefit their daily work practices, and felt that they were wasting their time. None of them seemed particularly motivated to learn GDPR prior to the mandatory training either. There were no rewards for them after completing the training either, aside from internal validation that they have completed it.

This was one of the common problematic side to mandatory training at organizations. The company spent resources to create the training and made sure that all employees have completed it. However, not much can be said about how much learning outcome the employees received, due to the combination of uninteresting topic and mandatory task that caused low motivation. The training itself would then only serve as a mean for the company to comply with GDPR. In an attempt to solve this problem, this research focused on exploring how serious games can be used in corporate training to engage employees and increase their motivation during training.

2.2 Staff training using games

In previously performed research preceding this thesis, a systematic literature review was conducted in order to find the usage of games in organizations. While the idea of using games in staff training was not new, relatively few research recorded the topic specifically in the organizational context. The search was therefore expanded to include any research that featured games or described game elements that were used with employees as target users.

The literature review revealed several reasons why the usage of games can be beneficial in staff training. Among these reasons were increased employee motivation, engagement or learning. Possible game or gamification elements that could be used to enhance these different aspects were unveiled during the search.

2.2.1 Increased employee motivation

The literature review revealed that Ryan and Deci (2000)'s self-determination theory is an important theory to reflect over when designing games with the aim to increase motivation. This theory defines three innate psychological needs: competence, autonomy and relatedness. Fostering these needs can facilitate "optimal functioning of the natural propensities

for growth and integration" (Ryan and Deci, 2000). Humans can then feel more motivated to extend themselves and master new skills. This benefit is one of the meaningful reasons behind the existence of serious games that aims to deliver more than entertainment alone.

2.2.2 Increased employee learning

The literature presented different methodologies used to facilitate increased learning. Petersen and Oliveira (2017) analysed three different games and applied the Reflection Continuum Model theory onto them. Their research suggested that reflection is an important element in order to facilitate learning through games.

Another interesting methodology used to influence a player's willingness to learn is to capitalize on their emotions through the usage of IT stimulus events (Darban and Polites, 2016). One such emotion is the emotion of challenge created by the lack of knowledge. Malone (1980)'s study describe that this challenge may invoke curiosity in players, which may make them feel driven to fill in the knowledge gap.

2.2.3 Game mechanics

The most common game mechanics used to facilitate either employee motivation or learning were discovered in the literature review. According to the literature, these mechanics were storytelling, simulation, or quizzes, among others. These mechanics are sometimes used as a combination of each other in order to achieve different effects.

While quiz-based games excel at increasing the learning aspect of games, it does not do well in increasing employee motivation. For this reason, motivation increasing elements are often added into quiz-based games. Filipczuk et al. (2019) used both storytelling and quiz elements in their game that teaches cyber security literacy. The game has the player immerse into the role of an inexperienced developer who makes poor cyber choices, and is tasked with saving the company despite their incompetence. This approach may add a layer of stress or expectation to the player, causing an emotion that could lead to increased motivation to answer the questions right. The quiz-based elements were mainly used to teach the players important cyber security tips. If a player fails a question, they are asked to review the learning material again, thus enabling self-learning.

Similarly, the game CLEVER by Elm et al. (2016) used a mixture of trivia and typical motivation-increasing game elements. The game consists of two phases: a trivia phase and an action phase where the player can choose to perform game-like actions such as attack, defend, or move. By answering the trivia right, the player may gain more energy to perform more actions in the action phase. CLEVER used much of Ryan and Deci (2000)'s self-determination theory when it comes to the motivation inducement of the game. An example is that winning the action phase can be an extrinsic motivation for the player, thus encouraging them to work hard during the trivia phase.

The research done specifically on the topic of game-based learning is more expansive than what the results of the literature review showed. While the literature review focused

on increased gaming in the workplace, more general game design theories that feature increased learning without a specific context can be argued to be useful.

2.3 High-level requirements for a serious game to support GDPR training

Combining the data collected from the specialization project, a list of high-level requirements were created to support the development of a serious game to support GDPR training. The requirements are divided into two types: game content and game design requirements, and can be used as a reference when designing the game concept. They are listed in table 2.1.

Type	ID	High-level requirements
Game content	GCR1	Should include basic information about GDPR relevant for all employees working in a company, even when they do not directly work with personal data.
	GCR1a	Should include information about the main principles described in article 5 of GDPR.
	GCR1b	Should include information about GDPR breach management.
	GCR2	Should include information about why it is important to learn about GDPR and the consequences of not being GDPR compliant.
Game design	GDR1	Could include different mechanics such as simulation, storytelling or quizzes in order to support both employee motivation and learning.
	GDR2	Should enable player reflection.
	GDR3a	Should be able to be played in smaller modules instead of one continuous experience.
	GDR3b	The length of each game module should not exceed 15 minutes.
	GDR4	Should contain interactive elements.
	GDR5	Could contain cooperation aspects.

Table 2.1: List of high-level requirements

Chapter 3

State of the Art

A literature review was conducted to further investigate important factors belonging to the game to be created. In the specialization project (Phan and Phan, 2019), a systematic literature review was performed to discover previously related researches done on the topic of staff training by using serious games in organizations, with the focus of finding game mechanisms that were used in such games. In this thesis, the focus is shifted towards discovering how games can be integrated into an organization.

A prevalent problem with traditional corporate training using methods that promote passive learning is the motivation of the learner (Donovan and Lead, 2012). Serious games with interactivity that encourages active learning, and engaging elements that can motivate players, can be a potential solution to this problem. However, in the perspective of the company, the cost of serious games and reorganizing existing training programmes may be too high for them to take the risk of implementing such a game (Bachvarova et al., 2012). To minimize the cost, it is therefore important to take into consideration the ease of integrating serious games into existing training programmes.

This literature review aims to support answering the research question RQ1.1: *How can a serious game for GDPR training of employees be integrated into IT companies?* It will focus on finding frameworks and cases of existing serious games used in corporate training to support the game design which will be described in chapter 4.

3.1 Search Strategies

As done previously in the specialization project, the PICO framework was used to aid in formulating the search queries needed for the literature review. While commonly used in evidence based medicine, this framework may also be used in the development literature search strategies (Schardt et al., 2007). PICO stands for (1) Patient Problem or Population, (2) Intervention, (3) Comparison or control, and (4) Outcome. In the case of usage outside of the field of medicine, Patient Problem may be exchanged for Population instead. The

question formulated by the PICO framework can be seen in table 3.1.

Population	For employees in organizations, corporate or in the workplace
Intervention	how can the use of serious games
Comparison	-
Outcome	be integrated into the company to support training?

Table 3.1: PICO framework elements

Based on the framework, an appropriate search query is proposed to be:

(organization OR workplace OR corporate) AND game AND training AND integration*

The online databases used in the search were mainly Scopus[1], Web of Science[2], IEEE Xplore[3], and Microsoft Academics[4]. The search engine Google Scholar was also used to search for any publications that were not directly accessible through the databases. Table 3.2 presents the results after the initial search in the databases.

Scopus	Web of Science	IEEE	Microsoft Academics	Total
70	23	20	58	171

Table 3.2: Database search results

3.2 Screening

The screening was done manually through reading the title and abstract of each publication. Duplicates across the databases were ignored. The following lists introduces the inclusion criteria that was used during the screening process of the publications. Relevant studies that fulfilled the criteria were included for further analysis. A summary of the screening process can be seen in figure 3.1.

The publication must pass all of the following requirements before being included in the next screening steps:

- The publication is in English.
- The publication has an abstract.

[1]Scopus (2020). https://www.scopus.com/
[2]ISI Web of Science (2020). https://apps.webofknowledge.com/
[3]IEEE Xplore (2020). http://ieeexplore.ieee.org/
[4]Microsoft Academics (2020). https://academic.microsoft.com/

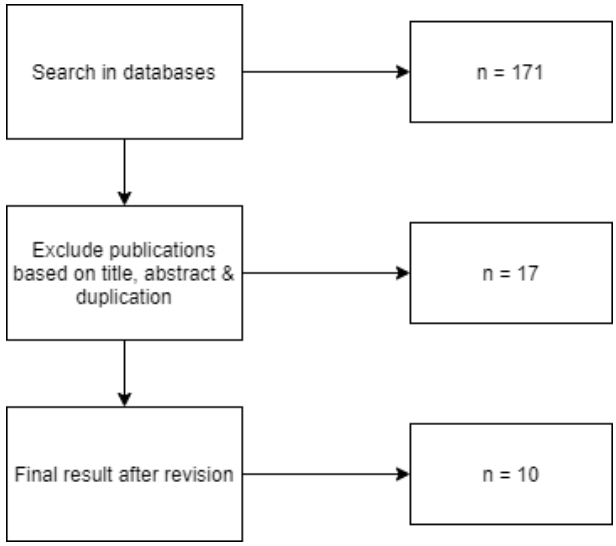


Figure 3.1: Screening process of the publications

- The publication is scientific, either published in peer-reviewed journals, an international conference of part of a book chapter.

The publications must meet at least one of the following requirements to be considered as relevant for this literature review:

- The publication describes the usage of serious games as a tool for staff training in organizations.
- The publication has serious game integration into companies as topic.
- The publication presents the usage of games to increase motivation or engagement in an organizational context.
- The publication includes “workplace”, “organization”, “company”, “corporate”, or “enterprise” in the title or abstract.

3.3 Results

3.3.1 Screening results

The systematic literature review resulted in 10 relevant articles. Each article promoted either a game used in corporate training in different fields or research about integration of serious games in companies. The initial screening resulted in 17 articles, but 3 of them were considered to be irrelevant as they were written by the same author and offered the information that can be found in newer articles, while the rest were a part of a conference

proceeding and could not be fully retrieved.

Most of the relevant articles came from Scopus and Web of Science. The same search query on both databases resulted in many identical results, and most of the articles chosen for this literature review were results from both databases. Searching in the Microsoft Academics database yielded many results, but most of them were not related to games in the workplace, and in the end yielded one relevant result that were already included from searching other databases.

Despite the search queries that focused serious games in corporate settings, many of the result articles were related to education. Due to this, there were many limitations that arose when choosing relevant articles, as the number of articles with focus on organizations were fewer compared to the entire search result. This suggested that there was scarce research on serious games integration in companies.

Among the final articles, three of them focused on presenting a serious game for training in a specific context. In the field of security and safety, practical training have always been used across organizations. However, large training with participants from different organizations were costly in both organizational and financial effort. Eller et al. (2018) proposed therefore a collaborative training using VR technology to replace the practical training. The approach used collaboration techniques and offered multi-user environments, in which collaboration was employed through implementing different roles and rights to the players. Meanwhile, Cone et al. (2006) proposed CyberCIEGE, which was to be a highly interactive resource management simulation game. The game was meant to support staff cyber-security awareness training, by raising security awareness through the means of simulating realistic scenarios. The last game proposed by Goeke et al. (2019) was meant to train employees against social engineering attacks. Similar to CyberCIEGE, the game uses realistic attack scenarios to test the decision-making skills of employees.

Several papers found researched on the topic of serious game integration into companies. Riedel and Azadegan (2014) presented a framework for a general use of serious games in corporate settings, and presented multiple cases of serious games use for different purposes. Riedel et al. (2015) expanded upon the same issue, and suggested an integration of serious games in the case of manufactoring. Rosmansyah et al. (2016) presented a gamification framework for designing online training in companies. The framework affected the entire training system in companies, and can be used for the entire organization. Senderek et al. (2015) presented an implementation guideline for the integration of game based learning into the corporate competence development, as well as design elements for instructional games. Zinke et al. (2018) made an emphasis on feedback in social serious games to increase motivation for corporate training. They suggested a combination of social serious game and Enterprise Social Networks (ESNs), which were meant to support a seamless integration into existing business progresses at the same time as increasing employee motivation, an issue that were found to be frequent with corporate training.

Petersen and Ekambaram (2016) aimed to examine how specific affordances of serious

games could support learning for project managers in their workplace. The motivation stemmed from the criticisms current training for project managers were facing, mostly due to the range of skills required of project managers to master, making it challenging to develop appropriate training. Based on existing research by Kolb (1984), Boud and Keogh (1985), Pannese et al. (2013) and Jih and Reeves (1992), Petersen and Ekambaram (2016) defined several learning aspects that were critical for project managers. These were identified to be experiential learning, reflection, interaction and feedback. In the end, they presented a model that could be used as a framework to evaluate the effects of applying serious games to learning systems. Similarly, Bachvarova et al. (2012) presented a framework for measuring the effectiveness of learning with serious games in corporate training using Kirkparticks' framework (Kirkpatrick and Kirkpatrick, 2006).

Several common themes were found while analyzing these papers. The role of reflection in the learning process was found to be important from analyzing these papers. Therefore, further searches with similar method was done. Replacing "integration" with "reflection" in the existing search query resulted in the following:

(organization OR workplace OR corporate) AND game AND training AND reflection*

The search results remained largely similar to the previous search, but contained a few more articles related to the topic of reflection. After screening them using similar criteria and analyzing their related works, three additional papers were found to be relevant and were included in the final literature review.

Pannese et al. (2013) focused on reflective learning with focus on the learning motivation from adults through the MIRROR project ('http://www.mirror-project.eu/'). MIRROR explored many techniques, and among them serious games held an important role due to the possibility of providing virtual experiences to encourage reflection. Pannese and Morosini (2014) expanded on the experience from MIRROR, and provided two serious games for care homes and hospitals to engage employees in reflecting on their past work performances to enhance their problem-solving skills. Petersen and Oliveira (2017) brought together different theories of reflection and introduced the Reflection Continuum Model for supporting reflection and game-based learning at the work place.

The results of the literature review are presented in the following sections.

3.3.2 Learning approaches in serious games used in companies

Simulation, quiz and role-playing games: learning by using experience and feedback

Among the final papers, there were several researches on the effect of serious games in organizations. Petersen and Ekambaram (2016) described learning environment of serious games that contributes to rapid competence development of project managers:

- Provide missing learning opportunities, alternative paths of decisions, virtual experiences and the possibility to repeat the experiences in a game to contribute to the experience base of the learner (Gouveia et al., 2011).

- Timely feedback on the learner's interaction within the game and the overall performance of the learner at the end of every game-session (Anderson et al., 2010).
- Opportunities for reflection through the virtual experiences and by replaying the game session to revisit the experiences (Pannese and Morosini, 2011).
- Cost-effective and safe environment to experience situated and contextualised learning.

According to them, a simulation or a serious game could enhance the project managers' experience and expose them to a variety of experiences in a safe space. Therefore, these characterization could be used to argue for using serious games in companies, especially in corporate training of any topic. In the paper, the authors focused on training of project managers, and highlighted the importance of experience for them. Based on this, they concluded that project manager training should have elements that would help them build up experience. They proposed a new approach method to support learning in project management that was based on experiential learning, learning by reflection, active feedback and interaction.

This approached was based on the concept of "learning by doing", in which project managers would learn while in the middle of project work settings, which may trigger reflection if their choice caused a gap between the expected result and actual result. Project managers would then reflect upon their decisions, and use this experience to handle a similar situation in the future in a more effective way. Timely feedback supported by interactivity is an important aspect in order to support learning in such contexts. By combining Kolb's experiential learning cycle (Kolb, 1984) and Boud's reflection model (Boud and Keogh, 1985), Petersen and Ekambaram (2016) presented a model that could be used as a framework to evaluate the effects of applying serious games to learning systems. This model is depicted in figure 3.2.

Zinke et al. (2018) proposed to deal with problems related motivation of the learner through the use of feedback, which would also serve as a way to support learning. They proposed to use a knowledge quiz with potential feedback mechanism to illustrate this approach. Their framework focused heavily on the use of different dashboard types and elements in an e-learning context, as well as their potential impact on learner motivation. According to them, feedback mechanisms support the self-evaluation process and self-directed learning and thereby satisfy needs for competence, relatedness, and autonomy. Hence, similar to Petersen and Ekambaram (2016), they concluded that feedback was an essential driver for motivation in learning (Reeve et al., 2008). Based on this theory, Zinke et al. (2018) designed three dashboards with visualization to display feedback. These were based on:

1. Learning analytics to show learning progression. Depending on the data, these could be questions played with difficulty levels, experience through using score, the number of correct and incorrect answers, etc.
2. Social network analysis to emphasize the social component of learning. These could

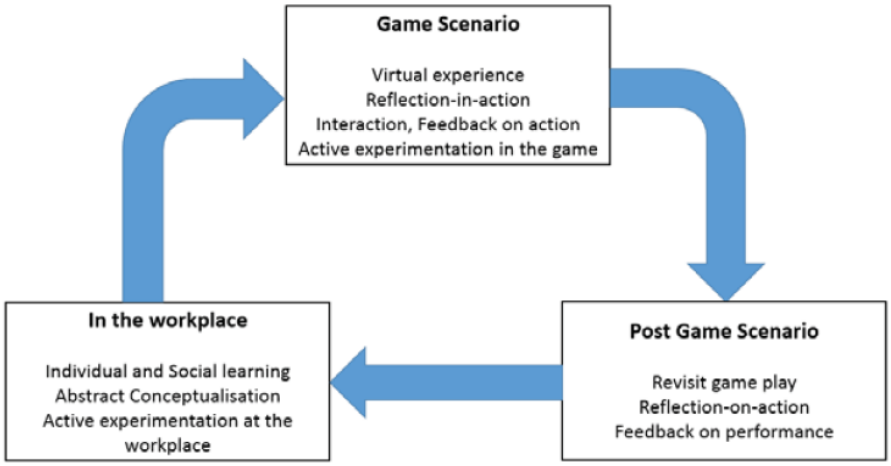


Figure 3.2: Experiential learning and reflection in Serious Games (Petersen and Ekambaram, 2016)

be social networking mechanisms like invitations, suggestions or endorse, or inviting colleagues to play together.

3. Game performance to challenge the players to improve their own results.These could be feedback summarizing game activities, with response time, score, the number of games won and lost by the user, etc.

Senderek et al. (2015) described concepts important for game-based learning to be successful as a way to replace traditional classroom learning. They presented several design elements of instructional games, and among the examples, familiar elements like simulation and quiz were listed as good examples that could be used in game design. Additionally, they defined the learning process as a cycle which consists of three phases: user behavior, system feedback and user judgement. Similar to the previous two papers, decision-making and feedback were important keywords here as well.

Goeke et al. (2019) took focus on the field of social engineering, which was defined as "the clever manipulation of human trust". Security concerns at companies mainly focused on the technical aspects, while remaining vulnerable to social engineering attacks. To tackle this issue, the authors proposed to use and enhance an existing online serious game, called *PERSUADED* (Aladawy et al., 2018), to raise social engineering awareness and train employees against attacks through the use of defence mechanisms in social psychology. The new game would be called *PROTECT*.

PERSUADED and *PROTECT* both uses realistic scenarios as the learning approach. In both games, the player would be presented with a scenario that could happen in their work life, and would be given choices the player could take as countermeasure. The game would give immediate feedback based on the choice. *SEAG* is another game presented in the same

paper with the goal to raise social engineering awareness, and it also used realistic scenarios. However, the biggest difference was that *SEAG* had in total three levels with different purposes. The first two levels had the goal to build knowledge base, by using quiz-like questions on the first level, and a matching game where the player had to match the correct term with the correct picture on the second level. The last level would test the player on their ability to detect attacks through the use of scenarios, similar to *PERSUADED*.

Riedel and Azadegan (2014) presented several serious games used for different purposes in companies. The research consisted of a case study to collect information about cases of serious games application in companies, with data collected from various resources, including experts, conferences, events, developer companies and the GaLA Network. The case study resulted in an overview of ways serious games could be used in companies, and a framework was then built to classify these different ways. They are: in corporate training, in active company intervention, through viral diffusion and with gamification. Amongst the cases presented according to these classifications, many of them used simulation to simulate a possible scenario that an employee may encounter while working.

INNOV8 (IBM, 2011) was an example of a serious game used for corporate training. The game used realistic events and processes to train employees in management of business processes. The use of interactive 3D made the experience of playing the game fun for the players, and at the same time facilitate communication between employees with different roles like business managers and IT staff of a company. The game was taken seriously by the employees, and proved to be an effective training method.

Furthermore, a 2D flash based role-playing game was created to help employees identify and manage stress as a part of corporate training. The game was developed by the Working Environment Information Centre in Denmark, with the goal to create an online experience that could be used by all public employees to teach them different ways to approach and handle stressful situations. In the game, the player could choose between different working environments that would come with different challenges. The goal was to have the player deal with different situations that could potentially create stress, so they may be able to identify and manage them in the offhand a similar situation occur in real life.

The authors also introduced Siemens *Plantville*, which simulated the experience of being a plant manager. This game was not a case used for corporate training, but of gamification. Players must identify and solve challenges to their plants in each levels, and compete against each other on a leader board. Measurement of their performance was based on Key Performance Indicators defined by the game. Not all of these games were designed to support staff training, but the use of simulation is prevalent across the serious games introduced by Riedel and Azadegan (2014).

CyberCIEGE introduced by Cone et al. (2006) utilized resource management and simulation to illustrate information assurance concepts for training. The game took the players to a virtual world and allowed them to achieve goals that would further the success of their enterprise by making players construct and configure the computer networks. While

managing these resources, they were also challenged to defend their networks from hackers, vandals and potentially well-motivated professionals. The process of defending from intruders served as a way to increase awareness, as this is a potential danger that could be encountered everyday for an employee working with cyber security.

In the basic user scenario for *CyberCIEGE*, the player would play the role of a security decision maker abroad a ship. In each scenario, the player would make decisions about real-life circumstances and immediately receive feedback about their choices. There would also be penalties if the player was to make a wrong choice, and the game would be won if the player completed all objectives without incurring "fatal" penalties. New scenarios would be added for each new topic identified in the requirements analysis, but the learning approach that focused on decision making and feedback remained the same.

Learning and increasing motivation through collaboration and cooperation

Riedel et al. (2015) conducted a survey to research the use of serious games in manufacturing industry. In the results, team work and collaboration skills were mentioned by the survey respondents. Considering that these skills were two topics important for employees according to the ABET Annual Impact Report (ABET, 2006), the authors presented two games that focused on this topic that had been used for several years in a corporate setting.

Eagle Racing (Angehrn and Maxwell, 2009) used the experience of collaboration and consensus building as the key learning points. The structure of the game was based on a binary tree, where all node levels represented dilemmas where either individuals or teams must come to a decision based on the information collected. In team plays, members were exposed to difficulties that threaten collaboration and maximize internal conflicts, in order to teach employees how to handle team collaboration dynamics in a business environment.

Another game presented in this paper was *Team-Up* (Barn, 2020), which was to be played by four players. These players would be cooperating to overcome a number of challenges that were designed to emphasize on various teamwork elements. Although the experiences from the game itself can be valuable for the players, the most effective learning comes from reflection. The game was meant to be played in a workshop setting, and the learning outcome of this game would be consequently achieved in the debriefing phase, where most of the concepts would be explained. According to the authors, serious games used for teaching complex topics should be used in blended learning settings, with briefing and debriefing session to complement and reflect on the game experience, possibly also with questionnaires.

Another game that incorporated collaborative aspects was the VR game introduced by Eller et al. (2018), that was meant to be played across organizations. According to the authors, immersive and interactive scenarios could be used to increase the effectiveness of learning. Employees did not only observe or listen passively but rather play an active part by influencing the digital environment around them.

The approach used collaboration techniques and offered multi-user environments in addition to VR technology. For this game, it was imperative that players were to be in the same "virtual room" for the game play, independent of their real-life location. In order to prevent problems related to user roles and responsibilities connected to the role, which could lead to problems with interaction between users, collaboration was employed through implementing different roles and rights to the players. This could be done for instance by restricting a task to be performed only by certain players with a specific role, so that only a player with the "master" role may be able to create a "virtual room". These techniques promoted cooperation while providing a wide range of possibilities for interaction between players, making their relationship in-game deeper than a single-player game that was typically used in corporate training.

Rosmansyah et al. (2016) emphasized on a collaborative working environment, where different actors, either human or not, work together to accomplish a common goal. Knowledge management systems (KMS) enable collaborative working and communication across an organization, making it possible for employees to share their knowledge and experiences. The authors suggest that by adding gamification elements in such systems, employees would feel more encouraged to share their knowledge with each other.

In one of the three dashboards previously introduced by Zinke et al. (2018), cooperation was a key learning element in increasing employee motivation and provide high learning outcome. As described, the dashboard integrated social networking mechanisms, which made it possible to support the cooperation aspect of learning without pressure from social comparison and status thinking, which usually stem from competition.

The authors identified competition through social comparison mechanisms as a way to enhance extrinsic motivation, however studies had showed that competition could have a harmful impact on learning in long-term. Therefore, they also proposed group challenges as an alternative, as it could serve as a way to enable social comparison without a strong focus on individual competition. As part of the dashboard, team achievements would also be displayed. Beyond it, a real-time chat was added as a reflection mechanism to support motivation enhancement and collaboration, at the same time give social feedback.

Reflection

Where learning has been discussed previously, reflection almost always arise as an important keyword. The cases of serious games above that provides learning through experience and feedback always emphasize on the importance of reflection in internalization of knowledge. In some cases, it is because of reflection that the design choices relies on using game scenarios. Due to this, further research on reflection was conducted.

The MIRROR project[5] aims to encourage human resources to reflect on previous experiences at the workplace and learn from them, and explored various techniques that can be used to accomplish this. Pannese et al. (2013) took experiences from this project and

[5]MIRROR project - Reflective learning at work. http://www.mirror-project.eu/

focused on how serious games can be used as a tool to trigger reflection. This can be explained through theories from various research.

The flow theory by Czikszentmihalyi (1990) can be used to explain how serious games can engage players in an activity, which can be positive in an activity where mandatory learning that can negatively affect learner motivation is involved. The observations about reflection-in-action and reflection-on-action by Schön (1938) can be used to exemplify reflective learning in the workplace. Boud's model (Boud and Keogh, 1985) can be used to explain the processes in reflective learning that focuses on the experience of the player. Krogstie (2009) proposed that reflection can take place both individually and/or collaboratively, and their characteristics typically make it useful to combine both for workplace learning.

With these theoretic background, the *CLinIC* serious game to foster reflective learning for a hospital in Germany was developed. The game consists of realistic graphics that resembles a real hospital, with many different scenes where players are required to make choices based on the options given by the game. After the game, the players have to do a self-evaluation based on pre-defined parameters. Here, the players have the chance to check and reflect upon their behavior during game play. Furthermore, post-game debriefing sessions to collaboratively reflect on the experience were also adapted to promote post-game reflection.

Further research (Pannese and Morosini, 2014) expanded upon the experience learned from the MIRROR project, where the design of two serious games for care homes and hospitals were presented. The game aimed to engage employees to reflect on past work performances to learn in 'real-time'. The result was *CLinIC* and *Think better CARE*, two 3D immersive serious games that focus on communication between nurses and patients in the hospital, and between carers and residents in the care home. The game provokes reflection by posing questions that create dilemmas. The objective is to prepare nurses and carers for situations that may occur in real life by enhancing their decision-making skills through realistic scenarios.

Both games also support experience sharing through an option for the player to "tell their story". In this way, experienced nurses or carers may reflect upon their own real life experiences and share this with their peers, thus enable cooperative learning. The player can associate their story with a non-playable character in the game, which other players may encounter at random during their game experience. The story will then be told to that player and the information will be shared between peers.

3.3.3 Integration of serious games in companies

Supporting platform

Cone et al. (2006) described several techniques that could be used in combination to support training. They can be found in table 3.3. Based on this table, several platforms that can support serious games integration can be identified. According to the authors, techniques

using computer-based and web-based mediums were common for staff training. This is also reflected in the cases of serious games found in this literature review presented in the section above, as many of them were either computer- or web-based. The 2D flash based role-playing game to help employees manage stress and *PROTECT* are both web-based, while *CyberCIEGE* is computer-based. Goeke et al. (2019) also described a concept for the provision of *PROTECT* as a web service, with advantages such as companies not having to set up their own infrastructure to deploy the game, while at the same time making it easy for the game to be integrated to other training platforms by using standardized application protocols with loose coupling between systems.

Technique	**Method**
Formal training session	Instructor-led, brown-bag seminars or video sessions. Dependent on the ability of the training facilitator to engage the audience.
Passive computer-based and web-based training	Centralized approach that utilized pre-made passive training on the computer. Employees have the option for a self-paced training, albeit passive and monotonous.
Interactive computer-based training	Interactive mediums such as video games, either first-person interaction games or resource management simulations.

Table 3.3: Techniques to accomplish training and awareness (Cone et al., 2006)

Eller et al. (2018) proposed a collaborative training using VR technology to replace practical training with employees across organizations in the field of security and safety. The transfer from the real-movement of a practical training to a virtual environment was done through the use of head-mounted displays and advanced tracking methods.

Zinke et al. (2018) proposed a combination of an e-learning platform using Enterprise Social Networks (ESNs) and a mobile-based dashboard as an approach to motivate learners. ESNs can be used both on computer and mobile devices to support various aspects, such as communication, knowledge management and collaboration. The choice of using mobile in combination of computer-based e-learning platform was made to support social learning and personal learning networks, with focus on knowledge exchange and informal learning.

Integration with working practices

As described in the previous section, table 3.3 contains techniques that could be used to support training. At the same time, this table describes different methods for integration of serious games with working practices. Firstly, instructor-led seminar is an option in order to have employees undergo training at the same time in a predetermined time slot that makes up one training session. Secondly, passive computer- and web-based training with predetermined learning content provides the opportunity for the trainees to undergo the training in their own paces. In this way, there are no constraints such as time limit, in

opposition to the first option. Interactive computer-based training through mediums such as video games work similarly to passive computer-based training when it comes to integration to working practices.

The VR collaborative game by Eller et al. (2018) allowed for multiple users in the same scenario through the use of "virtual rooms". The game was meant to replace existing practical training, and therefore the integration would consist of similar content, with different methods for setting up the training. For the VR game, it would mean setting up the equipment required to allow for VR game play in different locations, as opposed to practical training where employees had to gather together in one location to undergo training. The game works as a stand-alone game with no dependency on existing systems. However, the game was created to be modular and generic enough to support dynamic scenarios in different fields, so it may be used by various organizations for different purposes.

Rosmansyah et al. (2016) described a framework which implements gamification design in integration of online training and collaborative working environment. Many organizations today uses e-learning as a way to train their employees, and it is possible to integrate online training to such existing systems by using the proposed framework that consists of six steps: define objectives, delineate scenarios, describe user needs, system specification, implementation and evaluation.

Zinke et al. (2018) stated that the evolution of corporate training started when the traditional classroom training was replaced by e-learning, mostly due to the cost reduction that comes with using an e-learning platform. To take a step further, the use of learning management system (LMS) through an e-learning platform enables user management, which makes it possible for trainers to analyze and measure the learning. Further evolution includes social aspects, by learning through the use of network and informal knowledge exchange. Based on this, the idea of combining serious game and social media was formed.

The authors proposed to use a social serious game, through a combination of serious game and ESN, as a way to seamlessly integrate learning into business processes. By integrating learning functionalities into ESN, like courses or tests, discussion channels, chats, and tools for collaborative working, learning would no longer be separated from the other working processes. It would instead become an integrated part of daily business and thus, be more profitable than traditional learning approaches (Finke and Will, 2003).

PROTECT (Goeke et al., 2019) focused its implementation on enhancing the game with highly configurable game settings and content. This was done to ensure that the game can work as a stand-alone game, while at the same time allows for easier adaption and integration into a training platform. The same can be said other games found, like CyberCIEGE, that provided a flexible game that can be both generic and organization-specific based on requirement analysis.

Riedel and Azadegan (2014) defined four different uses for serious games in companies: in corporate training, in active company intervention, through viral diffusion and with gamifi-

cation. Cases of serious games used in corporate training and gamification were described previously. These cases mostly used interactive computer-based training or through integration with e-learning platform. As for company intervention and viral diffusion, different ways were used to integrate serious games in companies.

In the case presented for using serious games in active company intervention, LEGO Serious Play (LEGO, 2020) was employed to promote changes. This approach uses a facilitated workshop where participants are asked about different questions in relation to an ongoing project, task or strategy. The use of workshop also appeared in other games such as *Team-Up* that was previously mentioned. *Team-Up* was developed to support trainers, and provides various statistics and reports

For the viral diffusion, a case with ABC bank presented how a serious game could be used to educate and teach employees how to translate core company values to their daily work. Other integration of serious games discussed so far had focused on how to integrate a serious game into an existing training programme or process, however, the application of the game in this case was unique in that no consideration for an existing training process was needed. The company organized a "tournament day" to gather all employee in one large room, and had all employees play the same game. This method promoted competitive spirit, making the game enjoyable.

3.4 Discussion

Design of serious games for staff training

Cone et al. (2006) defined several techniques that could be used in combination to accomplish training in table 3.3. Traces of these techniques can be seen in other cases of serious games used for staff training, with most of them being either web-based or computer-based, and therefore use a computer as a medium. As most employees working at IT companies would be equipped with a computer to do their work, there are no extra cost when it comes to equipment.

Eller et al. (2018) proposed a collaborative VR game for training in the field of civil safety engineering. They used the technique of formal training session in the form of instructor-led training to accomplish this, in combination of innovative VR technology, which was not described in table 3.3. However, this choice can be compared to the technique of interactive training described in the table, in which the medium is a VR game and not a computer-based game. This proved that staff training can be accomplished outside the realm of computer-based games. Furthermore, Goeke et al. (2019) researched related works that used different types of game play for serious games, like card games (Williams et al., 2010) (Shostack, 2014) and physical tabletop games (Beckers et al., 2016).

The authors incorporated VR technology in their game concept as a solution to the problem of high organizational and financial cost in training. However, this approach would only be beneficial by replacing large training across organizations that require a number of physical

equipment, as described in this paper. For the type of training that can be accomplished using a computer, the use of VR technology would be more costly. Introducing VR to this kind of environment is not beneficial as it requires much more resource in term of hardware, as the number of equipment needed to set up VR games such as HMDs are expensive. Furthermore, the number of employees that can participate in the training at the same time are also limited to the number of gears available to the organization, thus limiting the collaboration between employees in the organization. Based on this, it can be concluded that VR is not a good choice when designing a serious game for corporate training with mostly theoretic learning content that do not require physical equipment, like GDPR. Rather, choices that involve less constraint on physical equipment like computer- and web-based games are better options.

Serious games for staff training with goals to raise awareness

Several of the cases found in the literature review were games with the intention to raise awareness as a topic. Taking *PERSUADED* as an example, a scenario was described to help employees protect themselves against phishing. In the scenario, the employee receives a phishing email asking to open its attachment. The employee would then get options with different countermeasure, with immediate feedback. The game is simple, with realistic situations that an employee could encounter during their everyday work. This is acceptable because the goal of the game is to raise *awareness*.

Simulation games such as *PERSUADED* function as a testing ground for the employee, and does not focus on the learning aspect. There is no way for the employee to learn about which the correct option is, as the player is expected to know the answer prior to playing the game. This game, similar to most of the other games described in the article, merely test the knowledge of the player and does not enable learning during game play. However, this is not the case for *SEAG*, which is described as a related work by the authors. *SEAG* includes the first level which encourages learning. The second level tests this knowledge in a fun way, in additional to the last level which uses realistic scenarios similar to the other described games. This increases the complexity of the game, as it encourages both learning and reflection during the game play.

Game scenarios

A recurring topic that appeared across several cases of serious games presented was the use of realistic events or scenarios in game design. The VR game proposed by Eller et al. (2018) mapped the practical training into a virtual one, and included realistic scenarios in preparation for a potential real life occurrence. In the examples provided by Goeke et al. (2019), serious games such as *SEAG*, *PERSUADED* and *PROTECT* all have realistic attack scenarios to raise awareness for potential security threats at the core. The same can also be seen in serious games used for other purposes than training, as illustrated by the cases provided by Riedel and Azadegan (2014). No matter the field, the cases of serious games identified during the literature review suggested the importance of realistic scenarios in game design.

Petersen and Ekambaram (2016) stated the importance of experience to project managers, as recalling a similar experience they have previously experienced makes it easier for them to make a decision in a future similar situation. This is something that can also be applied to other situations, not exclusively for project managers. This can be one of the reason why the use of realistic game scenario has been used many times in serious games for staff training. They also presented a model for experiential learning and reflection in serious games in figure 3.2. This model has three core elements, with one of them being "game scenario". The figure explains the entire learning cycle, and proves how important the concept of scenario and experience are to the learning outcome.

These simulation games often provide challenges that the player can tackle, which can enhance their decision-making skills. The goal of these simulations are not only to inform players with possible scenarios they may encounter in their daily work, but also to teach them how to handle them by providing possible choices the player can make under the circumstance. This is similar to using quiz, as the player would need to reflect upon their own experience and knowledge to answer the question the game is providing. Previous literature review in the specialization project has identified both simulation and quiz to be game mechanics that can be used to increase motivation, engagement and learning. Therefore, using scenarios through simulation games and quiz make the player take an active part in learning, which can help increase engagement and learning outcome.

Collaborative serious games for staff training

Collaborative games do not seem to be a popular choice when it comes to designing serious games for training. Most of the cases of serious games identified in the literature review and their related works consisted mostly of single player games, where the employees could choose to finish the training at their own pace. This is also reflected in the interviews with employees at an IT company done in the specialization project.

In the case identified from the interviews, employees were encouraged to finish training as soon as possible and received reminders on email, but there were no definite deadline and the employees could choose freely when and how to do the training. Some chose to finish the entire training in one afternoon, while others chose to do one module at a time and finished the training through smaller increments. Collaborative games may not be able to provide the same choice if the game require the multi-player aspect. However, a collaborative game does not need to be multi-player, as it may be incorporated without requiring several players to play at the same time, depending on the game design.

Riedel and Azadegan (2014) presented a case of ABC Bank that did not directly use collaborative elements, but had potential to support collaboration. The use of the "tournament day" with employees playing the same game in the same room promoted competitive spirits which could enhance engagement. However, it could be possible to employ a collaborative multi-player game where all employees could participate in this environment and promote collaboration instead of competition. The interviews also identified the use of workshop to facilitate a type of classroom training, as the information that can be conveyed through e-learning courses can be limited. While not the same as the "tournament

day", workshops makes it possible to gather employees in the same room and can possibly be used to serve the same purpose. A possible game integration could therefore be to organize workshops to have employees play the same game.

Collaboration is employed in the VR game proposed by Eller et al. (2018) through the use of different roles and rights. This point is important to consider when designing a collaborative game. For an instance, each employee may have different prior knowledge before undertaking training, and it is vital that the game designer must take this into consideration.

Knowledge sharing between employees can be made possible through using collaborative working environment. Rosmansyah et al. (2016) employed an e-learning platform as a collaborative working environment, and added gamification to an online training system to increase employees' learning motivation. Serious games may also enable collaborative learning, by sharing their knowledge and experiences in the game itself and making this visible for other players. This can be seen by *CLinIC* and *Think better CARE* previously introduced by Pannese and Morosini (2014).

Knowledge sharing can also encourage more communication between employees. An example is through the use of instant messaging which is one of the elements that ESNs support. Collaborative learning through workshops in games such as *Team-Up* also encourage communication, as employees divided in the same teams must discuss with each other and share their knowledge to face the challenges provided and make a decision together.

Integration of serious games in companies

Several serious games have been defined with examples of integration into companies. Several games, like *PROTECT* and *CyberCIEGE*, focused on having flexible and highly configurable games so the organization may develop their own content on top. These games can work both as a stand-alone and organization-specific game.

Many organizations use an e-learning platform today to train their employees, and the interviews with the IT company revealed that the integration into these would require complying to the organizational design rules. Many organizations may already have training in place, but many of the cases of serious games found were generic stand-alone games without a lot of dependency on an organization. Serious games may also be collaborative, which also affects its integration with working practices, as described above.

Storytelling

Storytelling was one of the three main game elements to increase engagement that was identified to be the most used element in the games found in the literature review in the specialization project. However, for this literature review, the word "storytelling" was not explicitly mentioned in any of the chosen articles. Despite this, some of the games found loosely have some storytelling elements in them, though most are connected to a role-playing game with fictional characters.

Riedel and Azadegan (2014) presented a game called *Vampire Hunt* used by SAP. While not directly mentioning the use of storytelling, the description of the game suggests the use of storytelling. This is a collaborative game where colleagues go on hunts together for energy-draining devices in specified locations. The story here could be based on a world where vampires exist, and the players were given a quest to hunt for the devices in order to accomplish some goals.

CLinIC and *Think better CARE* also contain elements of storytelling. The structure of these games are based on a branching story, where the scenes in the game differ based on previous choices the player has made. The player will experience the daily life at work as a nurse or a carer, and have to deal with different requests from patients. Players may also add in their own stories and share their experiences with other players, thus facilitating knowledge sharing between nurses with different working experiences.

Initially, due to the results of the literature review in the specialization project, storytelling was chosen to be one of the focus of the research. The original goal of this literature review intended to emphasize on finding storytelling games used for training in organizations, and therefore included storytelling in the original search query (i.e. *AND storytelling*). However, this search yielded no results in all databases, and the focus shifted to finding examples of serious games used for corporate training without a specific genre. The results indicated that storytelling is not usually the focus in these types of games, although some games may include these elements. Therefore, it can be concluded that while storytelling may be able to play an important role in serious games for learning in an educational setting to engage learner, it may not be the most practical choice to use in a corporate settings, due to the needs for realistic narratives in a more professional settings where the learner are often of an older age.

3.5 Summary

A literature review was conducted to investigate how serious games are being used in corporate training, and how they are being integrated into existing training. Several games in different fields were analyzed, including games not used for training but for different purpose in a corporate setting. The results yielded different alternatives for design decisions of a serious game to be used for corporate training.

Firstly, for a game to be used in an organization, the choice of computer- or web-based game is common, as it would not require additional equipment, assuming employees at IT companies would be equipped with their own computer. Many examples of serious games focused on presenting realistic cases to make it easier for employees to relate to their own situation, this is often accomplished through the use of simulation and role-playing games. For integration into companies with an existing training programme, the game should be configurable and make it easy for the trainer to dynamically change the content. By making the game configurable, it may work as a stand-alone game, while at the same time allow for easier integration. Another option is to forgo integration with

an existing platform by making an independent game that can be played at a workshop. The game can be played individually, but may also contain collaborative or cooperative learning elements to engage employees.

Chapter 4

Game Design of GDPR At Work

This chapter describes the concept and design of the serious game to be developed, called *GDPR At Work*. The decision regarding game design were made according previous research, mainly the document analysis, literature review and interviews done previously in the specialization project, as well as the results from the literature review done in chapter 3. This chapter aims to answer research question RQ1.2: *How can engagement and learning elements be used in a serious game to support mandatory GDPR training?*

4.1 Game Description

This section describes the target group, high-level game description, and lastly the goals of the game. The game is designed to support employees at IT companies to learn about GDPR. Due to the complexity of GDPR, the game will support learning basic GDPR knowledge. The game will also take into account the different roles related to GDPR training, and strive to accommodate to each of their needs through the game design.

4.1.1 Target Audience

The primary target audience of the game are all employees working at IT companies that require GDPR training. Previous research in the specialization project yielded that GDPR training is required only in companies that fit a certain criteria. This is not to say that the employees working at other companies are not relevant. They are considered as the secondary target audience. This game can be used at any IT companies, regardless of whether they are required to implement GDPR training or not.

As mentioned in chapter 2, the interviews revealed some challenges connected to the existing GDPR training. For the learner, mandatory training is not desirable, with some of them even regarding GDPR as an uninteresting topic. This combination can lead to low motivation and engagement. While GDPR training is only required to be completed once, most employees would not remember the content for a long time after training. Therefore,

the company revealed during the interviews that they planned on updating the training and require all employees to complete training after a certain time period has passed. This means that GDPR training is not only for new employees just starting out at work, but also for the employees currently working. This is why all employees working at IT companies, no matter age group, are the target audience, regardless of whether the company offer GDPR training or not.

The game design takes into account both the role of the learner and the role of the trainer. In this case, the learner would be the employees that must undergo GDPR training, while the trainer can be the DPO and the team responsible for creating and managing the actual training. A company is not required to appoint a DPO unless they are required to offer GDPR training. The game aims to support both roles, and therefore the primary target audience are employees at IT companies that are required to offer GDPR training. The employees at other companies are considered secondary target audience, as the game will only be able to support the learner and not the trainer.

4.1.2 Description

The results from literature review done previously suggested that serious games used for corporate training are typically simulation games with realistic scenarios, where the scenarios serve as a way to increase awareness. The game will follow the simulation of an office, where the player enters the game as an employee that just got assigned to a division in the company that gets assigned with work related to GDPR. The new employee will receive tasks on their new work phone, wherein the main task is to complete training related to GDPR in order to progress in their work.

For the learner, the game will have three main components that will support learning, reflection and awareness. The main learning process take place through the training room in-game, while reflection will take place through the use of a “meeting room” where the player must solve realistic cases related to GDPR breaches. Additionally, the game also supports cooperative learning in the “conference room”, where employees may gather to collectively undergo the training. This room may only be used when certain a criteria is met. The training room in the game consists of several levels which the player must complete in order to receive rewards and complete achievements. In each level, the player will learn a part of GDPR through traditional knowledge transfer, then reflect upon that knowledge through the use of game play and quiz. Lastly, the “meeting room” serve as a separate component from the level, as the cases here are independent from the learning content and may be solved at any time. The player will therefore have a choice to either complete all levels in the training room at once, or reflect on the realistic cases between the training levels.

For the trainer, their primary role is to maintain and update the learning content of the game. The interviews revealed that GDPR is highly complex, making it difficult to tailor the training in a way that suit each employee and their role. Furthermore, since GDPR does not explicitly state which part must be included in training, it is up to each company to decide what is necessary and create their own training accordingly. The purpose of

having the trainer role is to give the team responsible for creating training freedom to create more training content, making it possible to support future expansion of the game, enabling the game to be distributed to several companies. The game is created with the goal of future expansion in sight, and since each company may require their employees to learn different parts of GDPR according to their needs, the "final goal" of the game is for the employee to complete all training, but the learning content may differ if the game is used in different companies.

4.1.3 Visual Design

Much care was put into the visual design of the game *GDPR At Work*. Boller (2013) described a list of common game elements that could be used to improve the outcome, and aesthetics was one of them. She described that a game's aesthetics can engage players through its ability to facilitate immersion. Assets were therefore carefully chosen from a free stock image website freepik[1]. The website offered many different vector images, many of which looked clean and professional.

The visual design is not final, however. Interviews with employees from an IT company from the specialization project revealed that their company had their own visual identity that was created internally by their own designers. This is most likely true for many other companies as well. The game therefore aims to be developed in a way that make it easy to exchange assets for another should the needs arise.

4.1.4 Game Goals

The main goal of the game is to raise the engagement of employees going through GDPR training. Due to the complexity of GDPR, the game will only focus on some elements of the regulation that all employees should know, for an instance definition of elementary terms required to understand GDPR. The learning elements in the game are decided based on the contributions from the specialization project, such as the high-level requirements that can be used for game design with focus on requirements for game content previously described in table 2.1.

The interview with the DPO from the specialization project revealed several key content that are included in their training, and the goal of this game will consist of learning some of these contents. Firstly, when discussing GDPR, some elementary terms must be defined. These terms are included in Article 4 of GDPR, and some important terms are chosen from the document analysis. To understand the essence of GDPR, the seven key principles described in Article 5 of the regulation must be learned. Lastly, privacy by design and default is an important part of GDPR that should be learned, nevertheless of their role in a project.

The interviews showed that some employees have a dismissive attitude toward GDPR training, wanting to be finished with it as fast as possible. They do not consider the training

[1] freepikcompany (2010). https://www.freepik.com/

to be beneficial, and for the employees that do not work with GDPR directly, they consider the knowledge to be useless, as they do not think they can apply it to their work. Therefore, another goal of this game is to show the players how GDPR can be used through realistic scenarios, hence giving them a reason to value the knowledge they learn through GDPR training. Furthermore, the literature review done in chapter 3 showed the importance of realistic scenarios in serious games to the learning outcome and increasing awareness of a topic. Based on this, realistic scenarios are presented in the game as a separate entity, and are a part of the primary learning goal of the game.

The primary and secondary learning goals of the game are listed in table 4.1. The main focus of the game is to support GDPR training, and therefore the game will present some GDPR knowledge that employees working at IT companies should know. These include the core definition and principles of the regulation, as well as privacy by design and default. Furthermore, employees are generally not aware of how GDPR can be used and deem the knowledge to be useless. Therefore, the game will also present how GDPR can be used through practical examples. This will in addition serve to help employees identify examples of GDPR breaches. As can be seen, most of the learning goals were directly taken from the game content requirements from table 2.1.

Primary learning goal	**Secondary learning goal**
Know what GDPR is	Know some consequences of GDPR if not done correctly
Know what the key principles of GDPR are	Understand the benefits of learning GDPR
Know what privacy by design and default is	Learn about the application of GDPR
Know how to identify GDPR breach	Be able to handle GDPR breach correctly

Table 4.1: Primary and secondary learning goals

4.1.5 Requirements

Requirements for the learner

As a learner in *GDPR At Work*, the player should be able to learn about GDPR and reflect upon their knowledge in the topic. The literature review stated the importance of reflection in learning, and the game should therefore provoke player reflection in some way. It also revealed multiple learning approaches that can be used in serious games in a corporate setting. Among them were approaches such as collaborative learning and reflective learning. Selected findings from past research were compiled and put together as requirements for the learner role. These are described in table 4.2.

ID	Requirement for the learner
RQL1	Players should be able to learn about some part of GDPR.
RQL2	Players should be able to reflect upon what they learned.
RQL3	Players should be able to test their knowledge using a quiz.
RQL4	Players should be able to learn about practical uses of GDPR.
RQL5	Players should be able to learn in collaboration with other players.

Table 4.2: Requirements for the learner

Requirements for the trainer

The requirements for the trainer were derived from the interview results from the specialization project. The main task of a trainer is to provide training content to the learner. As mentioned, the interviews revealed that the employees do not consider GDPR training to be important as they do not know how to apply the knowledge outside of the training, therefore the game will focus on providing examples of practical uses of GDPR. The trainer will be the main source providing the cases with practical use of GDPR. Furthermore, for a company where GDPR training is a requirement, it is important for a trainer to monitor whether all employees have completed training or not, in order to send out appropriate reminders. Based on these points, the requirements for the trainer can be found in table 4.3.

ID	Requirement for the trainer
RQT1	A trainer should be able to add and modify learning content.
RQT2	A trainer should be able to add and modify cases with practical use of GDPR.
RQT3	A trainer should be able to ensure that all employees have completed the required training.

Table 4.3: Requirements for the trainer

4.2 Game Components: The Learner Perspective

The game will have the same components, but different views based on the role of the player. When entering the game, the player will be given the option to choose their role, either as a learner or a trainer. This section will focus on explaining the game design from the perspective of a learner. The goal of the game is to support GDPR training for employees by focusing on different learning approaches as well as raising the employee engagement. The overview of the game components and their purposes related to the learner are presented in table 4.4. Several game components functions both as elements to increase engagement and motivation for the learner, as well as a learning approach, while

others serve as guidance to the player and has no effect on the learning outcome.

Game component	Component part	Engaging or motivating element	Learning approach	Other purpose
Reception		-	-	Player guidance
Training room	Knowledge map	-	Reflection by showing player what they have learned and what they need to learn	Track learning progress
	Learning GDPR	-	Main learning source through traditional knowledge transfer	
	Testing knowledge	Time-based quiz	Testing knowledge through quiz	
Meeting room		Engage and motivate through presenting practical use of GDPR	Reflection through realistic cases related to GDPR	
Conference room		Cooperation can motivate players	Collaborative learning	
Phone	Achievements	Achievement as game element to motivate and engage players	-	Track learning progress
	Objectives	Motivation stemmed from exploration	-	Player guidance
	Instant messaging app	-	Knowledge sharing between colleagues	Provide guidance if needed
	Map	-	-	Player guidance

Table 4.4: Overview of game components and their effects on the learner

As previously described, there are three main components in the game that will support learning: the training room, the conference room and the meeting room. Additionally, the phone serves multiple purposes, such as game progression and providing guidance to the user, but may also provide a way to support learning. The reception holds no other purpose than a way to give players guidance during the game. It functions similarly to most of the parts in the phone, such as the map to help players navigate. The training room will contain two parts that will support individual learning, the conference room will support collaborative learning, while the meeting room will help the player learn the practical uses of GDPR through using realistic scenarios and cases. In this section, the requirements for the learner will be explained first, then each game component and the reason behind the design choices made will be explained in details.

Based on the requirements for the learner described in table 4.2, the decisions regarding

the game design were made. As a learner, there are three main actions that they can take during the game: learn GDPR, reflect upon their knowledge, and share their experiences. These can be considered as their main objectives in the game. Completing certain activities in the game will help the player complete these objectives. The relationship between the objectives, the game activities and the requirements for the learner are described in table 4.5. Each activity can be completed in different components of the game, and the same activity may support several objectives. These activities offer different learning approaches for the player, and some of them are optional.

ID	Objectives	Related to requirement	Game activities	Game components
OB1	Learn about GDPR	RQL1, RQL3, RQL4	(1) Access the training room to learn about GDPR through traditional knowledge transfer (2) Solve cases related to GDPR (3) Participate in individual or group quiz in collaboration with other players	(1) Training room (2) Meeting room (3) Conference room
OB2	Reflection of GDPR knowledge	RQL2, RQL4, RQL5	(1) Read the knowledge map and reflect on previously learned knowledge (2) Solve cases related to GDPR (3) Participate in discussions during collaborative training	(1) Training room (2) Meeting room (3) Conference room
OB3	Share experiences about GDPR	RQL5	(1) Answer a question on the instant messaging app (2) Participate in discussions during collaborative training	(1) Phone (2) Conference room

Table 4.5: Objectives and related game activities

4.2.1 The Reception

The game simulates the experience of being an employee working at a company. When entering a company building in the real world, it is often to see a reception, which often serve as a guide for a new employee entering the building for the very first time. The game offers a realistic simulation, and adding a reception will help increase the realism of the game. When the player enter the game, they will have the option to enter the reception. Interacting with the reception desk will allow user to choose their role in the game. As previously described, the player can choose between two roles: learner or trainer. Figure 4.1 shows an instance of a reception where the player is offered the choice between the roles.

Initially, the employees responsible for managing the training was given the role a man-

ager, but after the results from the evaluation of the game concept in chapter 5, the name of the role was changed to trainer, as the term manager gives off a stricter feeling. The game allows the player to switch between both roles, as it assumes that a trainer may be interested in assuming the learner role to test out the game. From the reception, the player may also be able to navigate between the different rooms in the game.

Figure 4.1: Illustration of reception and the initial player choice

4.2.2 The Training Room

The first room that will be unlocked after the reception will be the training room, where individual training will take place. In this room, the player can interact with a button to start training. As a learner, they will need to choose between two options once the training starts: “Learn about GDPR!” and “Test your GDPR knowledge!”. As described in table 4.4, the purpose of the training room is to help the learner learn more about GDPR through traditional knowledge transfer, as well as test their knowledge through the use of a time-based quiz. This room will facilitate the main knowledge transfer, thus is a main driver to complete the first objective *OB1* described in table 4.5.

The interviews revealed how their company chose to do their own training. The company employed an e-learning platform as their main training resource, and added GDPR training as an additional module that was mandatory for all employees. The module was divided into four parts with different topics. The structure of this game works in a similar way. A module in the training consists of information about one topic related to GDPR, such as Privacy by Default, and will be represented as one level in the game. The player will start out at level 1, and will proceed to the next level after completing both the learning and testing part in that level.

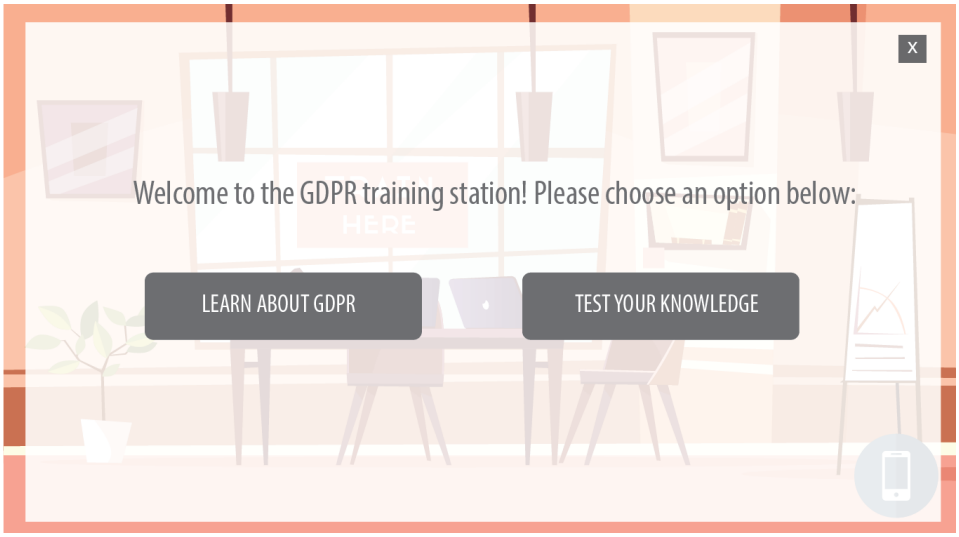


Figure 4.2: Illustration of the initial training options

Knowledge map

Before starting to learn or test knowledge, the player will be able to see an overview of the entire training content, with visible markings indicating which levels they have completed. The interviews with the employees responsible for managing the training revealed that one their main task after planning the training was to ensure that all employees have completed training. Therefore, it is important to provide the players a way to keep track of the training progress.

For the learner, looking at the knowledge map may prompt reflection. In the map, they will be able to see their current progress alongside what they have not yet learned. Looking at "what they have not learned", they may reflect back to the knowledge they previously learned during the game. This map will thus assist in completing *OB2*, the second objective of the game: reflection of GDPR knowledge.

Learning GDPR

The interviews revealed challenges related to creating GDPR training content, and there was no literature found that addressed this issue. In order to create the existing training, the interviewed company had to consult help from lawyers and other advocates. This was identified to be beyond our capability as we do not have access to such resources. Furthermore, the related works identified in chapter 3 did not include examples of existing GDPR training. Based on this, it was decided that the game will not focus on learning content, but rather on other parts that can enhance the learning experience, which will be accomplished using other components of the game.

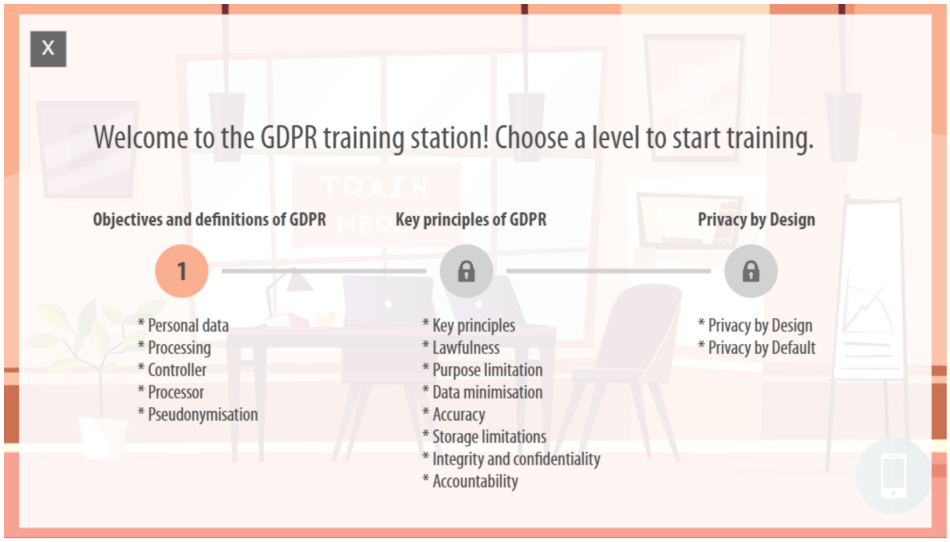


Figure 4.3: Illustration of the knowledge map

The interviews revealed that the training of employees on an e-learning platform are often divided into different modules, with each taking a limited amount of time. Therefore, for a company with existing training, they may add their training content to this game, and map each module into each levels.

Assuming the company must create the training content themselves, trainers can insert a set of videos with animations, figures or plain text. For each level, there will be multiple "pages", where the trainer may add training content, either in the form of videos, figures or text, on each stage. The player would press on the "next" button to go to the next page, and will complete the learning experience by going through all pages in a level.

Based on the results of the document analysis and interviews, the learning goals were derived, and three topics were defined to be the most important that must be included in basic training. Table 4.6 shows a suggestion for three game levels with their corresponding topics that can make up a basic training that all employees must go through. As an example, the first level will define a few objectives and definitions that are important to understand GDPR. The first stage of this level can explain what "personal data" means, and the second stage can explain what a "data controller" is.

Testing GDPR Knowledge

This component incorporates the result from the systematic literature review performed previously in the specialization project and use quiz-based elements as a tool to emulate learning. The player with the "learner" role has to perform an individual test in order to

Level	Topic
1	Objectives and definitions of GDPR
2	Key principles of GDPR
3	Privacy by Design and Default

Table 4.6: Topic in each game level

proceed to the next level of the game. The content of the test should be related to the learning content each level offers.

There are two different difficulties to the level test that the player can choose between: easy and hard. This choice is illustrated in figure 4.4. The easy difficulty has no timer and is designed for players who may not be comfortable with reading fast or the time pressure many games bring, such as older employees who do not often engage in gaming. In this mode, the player may take as long as they want to select an answer to the questions presented in each stage of the test. The hard difficulty adds a timer to the test, placing the player in a stressful situation where they must answer the questions correctly before time runs out. This mode emphasizes on the emotion of challenge, which may increase the players' motivation to take the test (Darban and Polites, 2016). Time-based quiz was also proved to be an engagement gameplay element by Saxegaard (2019). Another motivation-increasing mechanic related to the level test is achievement. Upon completing each test, the player will receive an an achievement depending on which difficulty the player cleared the level test on. For players who enjoy trophy-hunting, this may add an enjoyable factor into the process of taking the test.

The level tests themselves consist of different questions related to the GDPR that the player must answer correctly before being able to proceed to the next question. Each level may have a different amount of questions according to how comprehensive the accompanying learning content is. There are three different types of questions the player may solve:

Type 1: The player is asked to match a correct definition to a certain GDPR term. The term is displayed in the middle of the screen, and varying definitions will surround the term while enclosed in different boxes.

Type 2: The player is asked to match a correct term to a certain GDPR definition. This question type is almost the same as type 1, except in reverse; many term alternatives will surround the definition instead.

Type 3: The player is presented with a typical multiple choice question where only one alternative is correct. This type of question allows for testing of more in-depth knowledge that would require more space to present both the questions and the answers.

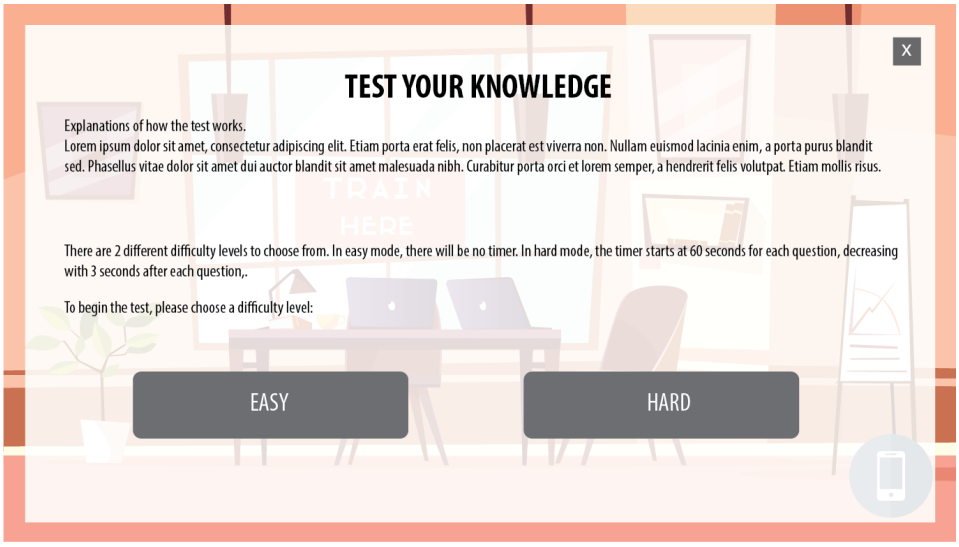
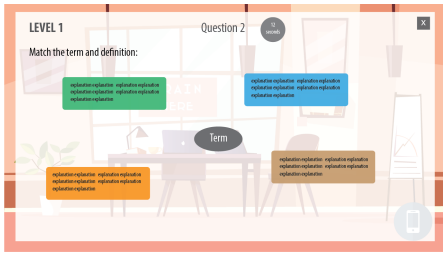
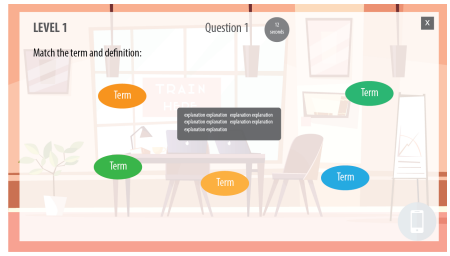


Figure 4.4: Illustration of the different modes in the test

Figure 4.5 illustrates the first two types of question. Type 3 consists of a common multiple-choice question in quizzes that many are familiar with, and therefore there was therefore no need to create an illustration for this type.



(a) Type 1



(b) Type 2

Figure 4.5: Illustration of question types

The presentation of these types of quizzes makes use of different colors and positioning in order to make the questions appear in a more fun way to the player. This variety, as opposed to the monotone pattern of type 3 quizzes (the common quiz presentation), aims to increase engagement in the player while doing the quizzes.

In easy mode of the quiz, the player may answer the questions at their own pace. In hard mode, the entire test will have a time limit of e.g. 60 seconds, depending on how many questions there are. For each choice the player makes, the timer will be shortened by 3 seconds independent of their correctness. This is to prevent players from choosing all

available options to brute-force through the test.

After the player has completed the test, they are given a result screen that shows the correct answers and a percentage of how well they did based on the percentage of correct answers they had. After this result, the player has the option to immediately advance to the next level of the game. This option is only available if the player has also completed the training part of the level.

4.2.3 The Conference Room

The literature review revealed different ways a serious game may be integrated into a company. To forgo the needs to consider existing training, it is possible to integrate the game through a workshop that functions independently. Based on this idea, the conference room is created. In this room, it is possible for employees to complete training either competitively or collaboratively through the use of individual or group quiz, similar to *Kahoot!*[2]. It is also possible for a trainer to arrange a training in groups, with tasks that can spark discussion between the players in groups, which can then cause reflection. All three objectives of the game can therefore be reinforced using this room, if planned correctly, as well as learner requirements *RQL3: Players should be able to test their knowledge using a quiz,* and *RQL5: Players should be able to learn in collaboration with other players.*

The VR game proposed by Eller et al. (2018) was made collaborative through the use of different roles and rights. In *GDPR At Work*, there are different roles: the learner and the trainer. Each of them may have different rights when it comes to accessing certain parts of the game. In the conference room, a training session must be set up by the trainer. They must decide the content of the quiz, and be responsible for gathering employees and instructing them on what to do before game play. From the interviews, it was revealed that the company also used a workshop as a method for additional training, as different employees may require different levels of training. In this way, knowledge transfer may also happen during the debriefing process, similar to *Team-Up*.

4.2.4 The Meeting Room

The literature review in chapter 3 revealed the importance of reflection through realistic scenarios in serious games used in companies. The realistic scenarios will be used to fulfill learner requirement *RQL4: Players should be able to learn some practical uses of GDPR.*

The interviews revealed how many employees consider GDPR to be “boring” and a “dry” topic to learn about, and does not consider the training to be important for their daily work life, unless they already work in a project related to GDPR. Therefore, for employees whose work is not related to GDPR, they would consider the training to be “useless” as they would never have to apply the knowledge in their work. As the training is theoretic, they do not learn about how to apply that knowledge to prevent GDPR breach, which is

[2]Kahoot! (2013). Kahoot: https://kahoot.it/

one of the most important reason to why it is necessary to learn about GDPR at all.

Due to the reasons stated above, the game design of *GDPR At Work* will contain a "meeting room", where the players will be introduced to realistic scenarios related to GDPR. In these scenarios, a case related to GDPR breach will be presented to the player, and they will encounter a situation where they must make the correct choices in that situation to prevent a GDPR breach. An example of one such case can be seen in figure 4.6. The cases may be derived from actual cases of GDPR breach that happened in the real world, or fictional cases that may cause the player to reflect upon their knowledge. The realistic cases presented to the players will strive to meet all secondary learning goals defined in table 4.1, at the same time complete objectives *OB1* and *OB2* of the game which require learning and reflection of GDPR knowledge. The case order is not linear, and players in the game may be able to complete cases in the order they wish.

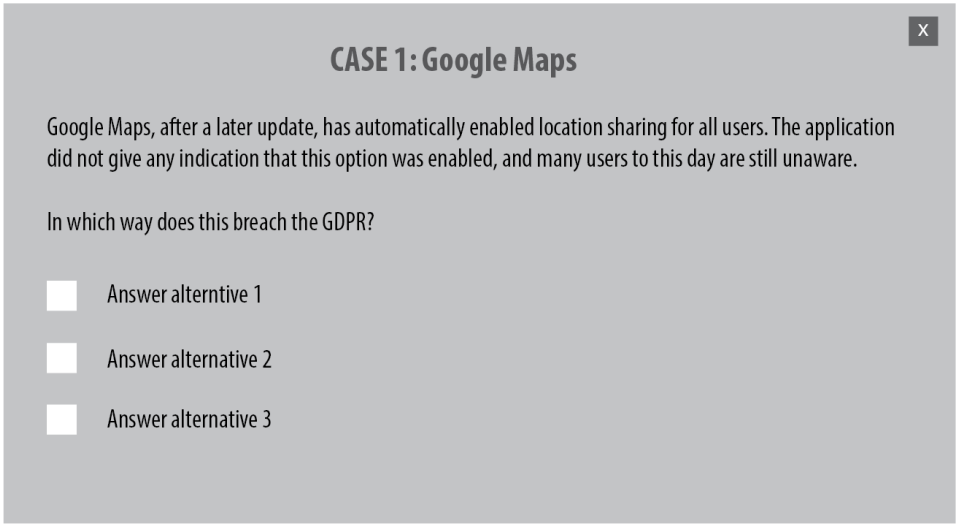


Figure 4.6: Example of a meeting room question

4.2.5 The Virtual Phone

The virtual phone component serves as a companion to the player. Should the player needs further direction in the game, the phone should always be able to offer tips and guide in order to help the player proceed through the tasks. It also offers a map—the main way of navigation within the game. The virtual phone component serves as a way to connect all the other components of *GDPR At Work*.

Several game design principles were incorporated in the design of this component. One such principle revolves around the game environment. Sweetser and Wiles (2005) divide between two different approaches in game environment design: scripting and emergence. Scripting refers to a game that limits the player with specific paths they can take to proceed

in the game, while emergence encourages exploration with no strict rules about what the player must do to proceed. Sweetser and Wiles (2005) described that these two approaches are two extremes of the same continuum, where a mix of both is preferred in game design. Following this, *GDPR At Work* will allow the player to explore freely, but will still apply certain restrictions to the player to ensure progression in the game. This is reflected in the design of the "Current objectives" component and the "Map" component which will be described below.

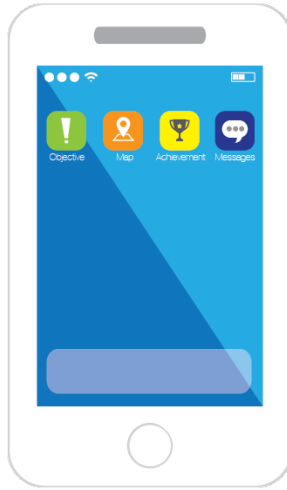


Figure 4.7: Illustration of the phone screen

Current objectives

The "Objectives" application on the phone is responsible for sending the player notifications about the next objective they should complete. The player progresses through the game by following the instructions given. By following and completing different objectives, the player can feel a sense of sequential progression in the game.

This component reflects the scripting approach in environmental design. The player is presented with specific choices where its completion would lead to another scripted path. It also incorporates the emergence approach in that the player does not *have* to follow the next objective. The player is free to take other actions in the game if they wish—the objectives only serve as a guide to progression.

Map

The "Map" application displays a map of all available locations the player can choose to traverse. These locations include the different rooms mentioned above: the reception, the training room, the meeting room, and the conference room. The role of this map makes it

possible to have a click-based game.

The map component and the objectives component are intricately connected. Based on the user's progress of the objectives, certain rooms are "locked" and the player is unable to access these rooms until further progress is made. This aspect of the map further enforces the scripted environmental design and allows a different view of the player's own progression. Emergence is also applied in the game as unlocking new rooms will make all the room's logic completely available to the player. The player can choose to either visit the previous rooms they have already explored or visit new rooms if they wanted to explore something new.

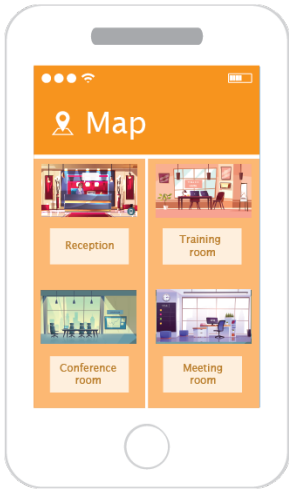


Figure 4.8: Illustration of a phone map for navigation

Achievements

The achievement game element has the goal to increase engagement in the game. Blair et al. (2016) experimented on the different types of achievements and the effects they have on different games. The types of achievements they experimented on included expected, unexpected and incremental. Expected achievements describe achievements that the players know to expect, while unexpected achievements are achievements that the players may reach without having prior information about them. Incremental achievements describe an achievement that the player may gradually earn through progressing over time. Blair et al. (2016) also tested on whether a pop-up method of presenting achievements during gameplay may engage the player more. After performing four studies, they concluded that a combination of these different types of achievements resulted in a discernible effect of learning outcomes. Taking this study into account, a design for the achievement element is proposed below.

The "Achievements" application displays all the achievements the player has accumulated

so far, along with the descriptions of how to achieve the locked achievements. This description makes the achievement into expected achievements. Small goals should also be added as unexpected achievements, such as unlocking something for the first time. Incremental achievements are also realized through a big goal such as "complete all trainings". The below table compiles a list of possible achievements the game can have.

Achievement	**Type**
Solve one case at the meeting room	Unexpected
Participate in a training at the conference room	Unexpected
Complete all level tests	Expected and incremental
Complete all level tests on hard difficulty	Expected and incremental

Table 4.7: Achievements examples

Instant messaging app

Zinke et al. (2018) presented a social serious game that combined ESN and serious game in corporate training. The use of ESN encourages features often used in social media, such as instant messaging applications. The authors proposed several functions of social networks that needs to be considered when designing a social serious game, such as networking, invitations, and content creation. Based on this, an instant messaging application were added to the game design of *GDPR At Work*, with the goal to facilitate communication between employees by giving them a platform to discuss topics related to the GDPR. Through this app, it is also possible for employees to inquire about a GDPR-related topic that they want to know more about, thus facilitate knowledge sharing between employees in addition. This game activity will complete objective *OB3* described in table 4.5.

4.3 Game Components: The Trainer Perspective

The trainer role was chosen to be incorporated into the game due to the research previously done on the topic of game integration. Several of the games identified in the literature review in chapter 3 was designed with the goal of future expansion in mind. Therefore, the game takes into consideration dynamic addition of content, by giving the trainer the opportunity to dynamically change the game content through their own interfaces. The game allows the trainer to change content in the components where learning and reflection takes place, namely the training room, the meeting room and the conference room. These editable components were designed to support the requirements for the trainer in the game, found in table 4.3. Table 4.8 shows an overview of what the trainer can edit in each of these components. Further details will be explained in the rest of this section.

Game component	Component part	Editable content
Training room	Learning GDPR	Training content of each level in the form of a set of videos, figures or plain text, or a combination.
	Testing GDPR	For each question: the question type, the question, alternatives, correct answer among the alternatives, timer.
Conference room		Quiz to be used for a competition. For each question: the question, alternatives, correct answer, timer.
Meeting room		Follow the framework described in table 4.9, each realistic case should contain the company introduction, the problem, a case description, a project description, a set of reflective questions. For each question: answer alternatives where one or several may be correct.

Table 4.8: Overview of what the trainer can edit in each game component

4.3.1 The Training Room

Learning GDPR

The learning part of the training room provides a learning source through traditional knowledge transfer in the game. As previously mentioned, this is not a main focus of this research. If the company using this game already have GDPR training in place, then this part can be used to replace their existing training. The interview results indicated that existing training on GDPR uses various media forms to train their staff. Therefore, in the game, the trainer will be able to add training content using different media forms, such as plain text, figures, videos or animations.

In order to fulfill trainer requirement *RQT1: A trainer should be able to add and modify learning content*, the training room will offer learning content through different levels, where each level will contain knowledge about a topic related to GDPR. To plan the training, the trainer must first plan what GDPR topics to include, and divide these into different levels. On each level, the training content may consist of different pages that describes different parts of the current topic, and the trainer will be able to add in a combination of different media forms for each page. Each page can contain different media forms that will be surrounded by a rectangular box, and if a combination of media forms are to be used, then the trainer can freely decide the placement of boxes on the page by selecting and dragging them across the screen.

Guideline for the trainer to add in new training content for each level:

1. Choose GDPR topic for this level and name the level accordingly.
2. Press on the “Add page” button to start adding in training content.
3. Add a title that describes the current page.

4. Choose a media type to add in content on the current page.
5. If “Plain text” is chosen, fill out the box with text and submit when done.
6. If “Figure” is chosen, choose a figure from the computer and upload on the page.
7. If “Video” is chosen, choose a video from the computer and upload on the page.
8. Optional: Move the added content if necessary.
9. Press “Add page” and repeat step 3-8 to add another page, or press on the “Finish” button to complete.

Testing GDPR

Just as in the learning component, there will be an interface which will make it easier for the trainer to administer the tests. They may choose between the 3 different types of test, and then manually fill in the content. This restriction to question types is due to the difficulty of implementing an editor that is good enough to display unaccounted for scenarios. It is still possible, however, to implement new question types through manual coding. According to the specialization project (Phan and Phan, 2019), this approach is already being used in some IT companies when it comes to staff training. Some companies would have their own staff team to handle expanding the staff training programme after adopting it from another source.

Guideline for the trainer to plan a level to test GDPR knowledge:

1. Choose question type through a drop-down menu.
2. Add the question text.
3. Add an alternative for the question. If alternative is the correct answer to the question, press the checkbox to indicate correct answer.
4. Add another alternative.
5. Adjust timer for this question.
6. Press “Add another question” and repeat step 1-5, or the “Finish” button to indicate completed planning of the current level.

4.3.2 Trainer Dashboard

The realization of *RQT3: A trainer should be able to ensure that all employees have completed the required training* will be done through a trainer dashboard. This dashboard will display a list of all learners and data of whether they have finished their GDPR training. This data can be retrieved through the “Achievements” database, where a learner who has achieved the “Complete all level tests” achievement is considered to be finished with their training.

Other data suggested to be included in this dashboard is the learner's identification information within the company, such as their work email. This is necessary in order for the trainer to identify the learner and ensure an easier way of contacting them through e.g. reminder emails if they did not complete the necessary training within an allotted period of time. This is sensitive information, however, and should not be stored in an any accessible database that the authors can set up. Should this solution be adopted, the company is encouraged to set up their own back-end to handle these sensitive data.

It is possible that the trainer could be interested in other sort of data from the learner as well. Further research will be done in order to find out what sort of information the trainer would be interested to see in the dashboard and, in return, the degree of which the learner is comfortable with sharing these different information to the trainer.

4.3.3 The Conference Room

For the trainer, the conference room in the game will work similarly to the part in the training room to test GDPR knowledge. The trainer will be the one responsible for planning the training, in which they must plan when the training will take place and send out invitations to the employees that will participate in the training. This must take place outside of the game for such a company-wide communication functionality is redundant inside the game when it already exists in the form of e.g. email already.

The trainer must also be able to add and edit the content of the quiz to be used in the training session. This step should be similar to the steps needed to create a new level test in subsection 4.3.1. A quiz should have a series of questions and several different answer alternatives for each question, where one or many alternatives them can be correct. It also should contain a timer which the trainer can set based on how complex the question is.

4.3.4 The Meeting Room

The meeting room is where another central learning approach takes place. As previously described, the learner will be able to learn GDPR through realistic cases in the meeting room. For the trainer, this means that they should be able to add in relevant cases to the game. This is related to *RQT2: A trainer should be able to add and modify cases with practical use of GDPR*. The below subsections describe a small study of how information can be presented in realistic scenarios and the subsequent framework to be used when adding cases or scenarios into the meeting room.

Presenting information in realistic scenarios

As mentioned in the learner's perspective of the meeting room (subsection 4.2.4), the cases to be included should contain information that help the learner fulfill the secondary learning goals proposed in table 4.1. In order to achieve such an effect, the scenarios should be presented with clear enough information and enable a way for the learner to reflect. Our intended fictional scenarios are similar to case studies on real subjects, hence we looked into how GDPR case studies have been presented or reported in the research field in order

to find inspiration for our own framework.

Henriksen-Bulmer et al. (2019) presented a case study of implementing GDPR in the charity sector. Their presentation of the case started with descriptions of the background, where they explained the charity's work and how GDPR impacted it. More specifically, they described the kind of information that the charity collected, and explained why exactly it was problematic according to the GDPR. Henriksen-Bulmer et al. (2019) then explained the approach they took to solve the case, and finally, the evaluation of the framework they produced as the solution to the case.

Gruschka et al. (2018) presented two different case studies about achieving privacy in big data. In presenting their case, Gruschka et al. (2018) also started with introduction of the affected parties, and then proceeded to describe how GDPR has impacted them. They described that the affected party needed to fulfill a set of requirements in order to conform to the GDPR, and then accordingly defined these requirements and terms. For each requirements that were needed to fulfill, Gruschka et al. (2018) explained their specifics and the actions taken to solve these problems.

These two reports had a somewhat similar approach in their case presentation. Both thought it important to present first the background of the relevant parties. The first study explained first the situation around all charities in general, and then proceeded to describe the selected charity which was their focus. The second study featured mostly a single party, an organization or project that had to conform to the GDPR. Based on this, starting a scenario with a background description of the affected party is a sound idea.

The next identified information to be included seems to be description of GDPR's impact on the affected party. This description provided different requirements the GDPR sets that the party must follow in order to conform to the regulation. We interpret this step as *a cause or a problem* of the scenario. This cause should include the specifics of why GDPR posed a problem to the affected party, and a brief explanation of what the party must do to solve this cause. The presentation of the problem should be brief in order to quickly introduce the learner to the case.

As the problem description of the scenario is brief, next step should be to expand on it. In the above case studies, both authors defined the kind of information the affected parties collected, and then provided descriptions of how the collection process did not conform to the GDPR. This detailed description of the violated details is the basis of the case, and we define it as the *case description*.

Lastly, the case studies explained the approach that was taken to solve said problem. This explanation consisted of different steps for both studies—one case study developed a framework for general use among charities, while the other created a solution specific to the involved party—but still drew some similarities towards each other. One such similarity was how they expanded upon the cause and explained in details exactly the affected component of the affected system and the steps taken to solve it. This definition of the

affected component is important in order to develop a solution, and should be included in our framework as well. We identify this step as a *solution description* which should include in details the affected components of a system and the solution developed to solve it.

Framework to Develop Realistic GDPR Scenarios

By analyzing the way in which GDPR case studies were presented, we identified a set of information that a realistic scenario in the meeting room should include. These information can be interpreted and transformed into guidelines for adding a scenario into the game *GDPR At Work*.

The degree of how much the learner can relate to the scenario is important in order to create the sense of realism even in a fictional case. In order to recreate this sense of relatedness in IT employees, the scenario should contain usual work practices that are common in IT organizations. One such common concept is the idea of working in *projects*. A project is defined as an effort to create or modify a specific product or service.[3] It is a common concept among IT organizations, where employees are hired to work in specific projects. Another common concept could be the act to work in teams. While there are projects that can be completed alone, it is often that a team is hired to work on a single project to increase the development efficiency. Some scenarios could mention these common practices if it fits with the scenario in order to make it be easier related to.

Another requirement the scenario should have is a way to facilitate learner reflection, satisfying *RQL2: Players should be able to reflect upon what they learned.* Several of the games found in the literature review in chapter 3 revealed that the use of reflective questions is a good method. The highly relevant game CyberCIEGE described in the learner's section of the meeting room also made use of questions at the end of a realistic scenario when facilitating reflection. *GDPR At Work* will also incorporate this practice where reflective questions will be asked at the end of a scenario.

Combining all the gathered information, the framework in table 4.9 describes all the information a scenario or case should be included. The order of the steps were gathered from the previous section, *Presenting information in realistic scenarios*. A trainer who is following this framework should identify the different required information from their desired case and add them to the meeting room in the proposed order.

[3]University of Illinois System (2020). https://www.aits.uillinois.edu.

Information	Description
Introduction to the company	A GDPR scenario should start with explaining the background of a fictional company.
The cause or problem that led to a project	Should include a short description of how the GDPR has impacted the company and what requirements the GDPR is setting for the company to fulfill in order to conform to the law.
Case description	Define in details the kind of personal data the company collects, how it is used, and explain why this does not conform to the GDPR.
(Optional) Project description	Describe the resulted project that was created in order to fix the problem. This project may fix one or several parts of the problem. Be clear about what was the solution to exactly which problem.
Reflective questions	Create multiple-choice questions that would help the learner reflect. If project description was not added, reflective questions could ask about what the possible solutions to the problem could be. If project description was added, reflective questions could ask about the evaluation of the result of the project.
Reflective answers	There should be a thoughtful answer behind why each choice was correct or incorrect. It is important to provide the exact GDPR principles that were involved in the solution.

Table 4.9: Framework used when adding a realistic scenario into the meeting room

Chapter 5

Game Concept Evaluation: Group Interview

This chapter describes the first evaluation with NTNU students with the purpose to raise new insights and perspectives on the concept of the game. The main goal of the interview was to receive feedback on the current game concept and design, and find ways to improve it before the final evaluation. A combination of a slide and a wireframe was used to explain the game concept, and questions were asked at the end to facilitate discussion. Changes were made to the game design after the evaluation.

5.1 Method

5.1.1 Group Interview

To evaluate the game concept, group interview as a qualitative data collection method was used. Group interview can be used to generate varied response from various parties, and encourages discussion amongst participants which may bring forth new ideas by expanding upon the topic at hand. Using group interview as a method is also less time-consuming than individual interview, as the interview holders only need to explain the topic once. However, a disadvantage with holding a group interview is the possibility that some opinions of the participants may be lost under the discussion. Furthermore, some participants may find it more difficult to express their opinions in a group.

Krueger (2014) believes that rich data can only be generated if individuals in the group are prepared to engage fully in the discussion and suggests that participants should share similar characteristics. Furthermore, a group interview normally have between four to eights participants, as the risk of some participants being more dominant in voicing their opinions increase with the number of participants. With this in the background, five students from NTNU were chosen to participate in this group interview. All five have similar back-

grounds, as they are currently in their last year of computer science studies. Additionally, two of them had background related to game design. However, due to personal circumstances, only three were be able to participate in the interview in the end. As two out of three participants were more knowledgeable with game design, it was concerning that the last participant may not be able to voice their opinions due to them being unfamiliar with the topic. However, this seemed not to be the case, and the few number of participants ensured that every participant adequate time and space to state their opinions, and participants with different backgrounds provided varying opinions.

Due to the situation with COVID-19, it was not possible to hold the interview physically with the participants. An online meeting was therefore organized through the video conference tool called Zoom[1]. The interview holders prepared a presentation to explain the game concept that lasted approximately 15 minutes, and presented by sharing their screen with the participants. Afterwards, questions were prepared beforehand to facilitate discussion between participants.

5.1.2 Presentation of Game Concept

The game concept was presented through the use of slides. A wireframe of the game was prepared beforehand, and screenshots of some selected images from the wireframe were inserted in the slides. The choice to use slides to explain the game concept was due to the complexity of the topic. The students have little knowledge of GDPR and it is important to present the concept in a way that will make them understand why it is necessary to use a serious game for GDPR training. Furthermore, by providing figures with explanatory text, it is easier for the participants to follow throughout the presentation. The figures from the wireframe were made with background resources from Freepik[2], and edited using Adobe Illustrator[3]. The slides used for the presentation can be found in appendix B.2.

5.2 Group Interview Results

The questions were asked after the presentation. The questions are divided into categories: questions about game concept and questions about game play and elements. The questions can be found in appendix B.1. When asked about their opinions on the current concept in general, all participants reacted positively. All of them mentioned that it was positive that the game resembles a real-life situation. *"It is neat that the concept is realistic, as it would fit to be used at a company."*

The questions about the game concept also directed toward more specific parts of the game. When asked about their thoughts on the current "levels" under the test knowledge option on the computer, the participants all agreed that it might be confusing for players not familiar with games to have different modes such as easy and hard mode. They thought that despite the explanation on what the different modes entail, *"It would be difficult if the*

[1]Zoom (2011). Zoom Video Conferencing. URL: https://www.zoom.us/
[2]Freepik Company (2010). Freepik. URL: https://www.freepik.com/
[3]Adobe (2018). Adobe Illustrator CC. URL: https://www.adobe.com/

players do not know the difference between easy and hard mode." One of the participants suggested to change the name of the modes to "with timer" and "without timer" instead of "easy" and "hard", as it would be easier for the player to understand. They also thought that it was good to have different modes, as it can adapt to the level of the player. Furthermore, when asked about their thoughts on whether to add more "mini-game" to test the learner's knowledge, the participants reacted negatively. *"It would become a collection of different games, and the game itself would become a different kind of game."*

When asked about their thoughts on the phone, a participant expressed that they did not fully understand the role of the phone. They thought that it meant the *real* phone of the player playing the game, and not the *virtual* phone inside the game. According to them, the interview holders did not explain the role of the phone in a clear way, and thus caused a misunderstanding. Another participant mentioned that it was good to have a central place that can provide instructions to the player. *"Players should have a place to check when they are unsure about what to do."* Additionally, a discussion regarding the instant messaging app occurred. A participant thought that if the goal of the app is to receive questions, then it would be better to have a "question board" on the phone instead of an instant messaging app.

The literature review in chapter 3 revealed the importance of future game expansion when considering integration and game design. The participants were invited to share their thoughts on topics related to game expansion. When discussing the possibility of the trainer adding more game content later on, they thought that if an employee already finished one level of training, then it would be strange for the trainer to update the existing level, because then the employee would need to do the level again. Therefore, they pointed out that the manager should add content in "packages" with complete content. Otherwise, the player would need to replay the level.

The game includes a learner role for the employees to learn GDPR, and a manager role to support integration into companies. When discussing the instant messaging app on the phone, a topic arose about the different roles employees may have in this application. For an instance, when a player asks a question on the instant messaging app and receive answers from multiple sources that contradicts each other, it could be difficult for the player to know which answer is the correct one. Therefore, if some players with more experience dealing with GDPR have a different role, for an instance a "GDPR expert", then other employees would know they can be trusted. In the end after the discussion, it was agreed that there was no need for extra role, as it might be more confusing in general. While on the topic, a participant also mentioned that the term "trainer" may be a better option rather than "manager". They thought that *"the term manager sounds a lot stricter than trainer, as a manager sounds like someone with much more power over you in the company hierarchy, like your boss, while a trainer sounds a lot friendlier."*

The reception was added to the game design so the player may have a "starting point" in the game. When discussing the role of the reception, a participant thought that it could be good to add more content to this room, as in the current design it does not serve any

purpose other than choosing roles. *"It could be a good idea to add in a receptionist NPC so the player can ask about what they should do next."* The NPC would then give more detailed information about the next step compared to the phone that gives out objectives for the player to complete. It was pointed out that the process of choosing roles does not need to happen in the reception, but can also be made possible through an application on the phone. However, they thought that the receptions should be included, as the game is a simulation of a company, and most companies contain a reception where a new employee would encounter when they enter the company for the first time. Furthermore, another participant suggested that it could be a good idea to have a blank space in the design of the reception to contain a company logo.

When discussing the reception, another discussion occurred around the topic of choosing roles. A participant thought that it does not make sense for the players to be able to choose between roles freely in the reception due to security concern. *"What happens if someone add in bad or incorrect content because they are not a true trainer?"* Another participant suggested to have the player choose their role when the game start and add another security layer on top to prevent unauthorized access. Another then suggested to share a password among trainers and at the same time require an extra authentication step to enter this password when choosing the trainer role.

The role of the conference room was to facilitate collaborative learning and increase engagement among employees through a Kahoot!-like environment by having employees compete in quiz or solving cases, either individually or in groups. The current design does not provide detailed description of how the room was supposed to work as the authors were considering between two options: integrate directly to Kahoot! or create a design based on Kahoot!.

A participant thought that it would not be good to integrate directly with Kahoot, as the player would have to exit the game and access a new interface, which could disrupt the game flow. Therefore, they thought that having a design that resembles Kahoot! would be a better option. Another participant pointed out that Kahoot! was already a well-known game proven with research that can be used to increase motivation and learning outcome, and therefore require little adjustment if the idea was to be added to the game. *"Kahoot is already good enough due to existing extensive studies, so we don't need to change much about the idea or design."* Furthermore, they thought that this is a decision that can be decided by the company, and suggested that if the company do not think having something that resembles Kahoot! is a good idea, then they can rather have a ranking of the training results.

The meeting room that help learners know about applications of GDPR was met with positive feedback. The participants agreed that it would be engaging to apply GDPR to actual cases, either real or fictional, as training that only consist of theoretical knowledge transfer cannot be considered fun. *"GDPR is a dry topic to learn about, so it may affect the motivation of the learner."* A participant thought that the case can also be relevant for an actual project in the company, and suggested a concrete example. *"For an instance if a company*

decided to have a project where they use facial recognition, then the game can present that case to ask the employees if that is a good idea when it comes to GDPR." Furthermore, a participant raised an issue related to security when adding new cases. They thought that it would be better to give only the trainer the right to add in new cases.

When asked about their thoughts on the current game elements, the participants agreed that *"there were enough game elements to call this a game."* A participant suggested adding more NPC characters to fill out the game maps. For an instance, add characters with predetermined dialogues discussing GDPR that the player may "overhear" next to a coffee machine or add a lunch room where these dialogues may take place. Another participant suggested to have NPCs with chat bubbles to indicate possibility for interaction, and have them in different places to give out objectives instead of having it centralized on the phone.

Several game elements were added to increase employee engagement. When asked for feedback regarding these elements, the participants suggested several ideas. *"Music can be used as a game element to engage players, as well as points."* These were examples of game elements to increase engagement used in Kahoot!. They also suggested to use animations and sound effects, and included examples from popular games such as Candy Crush Saga[4]. The participants agreed that *"it is difficult to make such a dry topic engaging,"* and had difficulties coming up with concrete ideas on how to improve the current game elements to make it more engaging for the learners.

The current game design does not include any penalties when the player does something wrong. When testing knowledge about GDPR, the authors suggested to increase the time deducted if the player answer wrongly. This way, the time will decrease at a faster rate, thus increase the difficulty. A participant pointed out that a person do not learn as well when they are stressed out, and therefore should go easy on the time limit. This might even cause frustration for the player, as people are generally not happy with penalties. *"They want to have more opportunities to get correct answers, as they would feel better about themselves."* Instead of the current way the timer works, a participant suggested to use a timer that works similarly to the one used in chess matches. The timer indicates the total time a player have to answer questions, and it increases every time the player answers correctly.

When discussing about the way the character can be controlled, the participants thought that it would be out of scope to have a player controller a sprite to travel throughout the office, and it would be better to have a click-based game for easier and faster navigation. The participants agreed that having a click-based game with a first person view make the game more realistic, as the player would be "seeing through their own eyes". A predetermined sprite can make it difficult for the player to relate to them, as a default sprite may not look like the player themselves. According to the participants, for the player to relate to a sprite, the game would need character customisation. Furthermore, for a click-based game, the participants thought that the design should be more obvious about what the player can interact with in the game.

[4]King Digital Entertainment (2012). Candy Crush Saga. URL: https://www.facebook.com/candycrushsaga/

5.3 Discussion

5.3.1 Method

Two of the students that participated in this evaluation can be considered as an "expert" in game design, as they are also working on a master thesis that involves making a game to increase awareness in a topic related to privacy. Furthermore, as they are all in their last year in their computer science major, all of them would be starting to work in a company after a few months, and may encounter GDPR training themselves. Based on this, all of them can be considered as relevant end users for the game, and would fit the role of a learner in the game. Therefore, the presentation included mostly elements of the game that were relevant to the learner, in order to get feedback from relevant users.

Throughout the online meeting, no videos that contained faces of the participants were turned on. This made the interview felt impersonal, but at the same time may provide the participants a certain degree of anonymity that might encourage them to speak their mind freely. However, due to no camera, it would be difficult to recognize who is speaking under the discussion unless the interview holders were familiar with the voices of all participants. Furthermore, it was not ideal to use a video conference tool as a communication method due to unclear sound that may be caused by unstable network. Several times during the interview, both the interview holders and participants had to repeat their statement as the sound was unclear. This may have caused some misunderstandings, and at the same time caused the interview to last longer than it should.

Not all of the wireframe was shown during the presentation, as the goal was to use a combination of selected figures and keywords to describe the game concept. This method was successful in conveying the game concept, as the participants remarked that they understood the purposes of the game components and did not question why some of them were chosen to be included. However, during the discussion after the presentation, the participants remarked some points about the design that were already in place. However, as the entire wireframe was not shown, a few misunderstanding occurred. Most of these comments were about how the design should be more obvious in showing the game objects the player can interact with.

5.3.2 Results

The group interview pointed out several interesting issues that need further consideration. Firstly, what should happen when a trainer wishes to update existing training content? This is a valid concern, as the same topic has been discussed during the interviews with the data protection officer from the specialization project. According to them, the regulation may change as time passes, and they were considering to update the training with new content if such a situation do occur. The participants in the group interview suggested either not giving the trainer an option to update a current level but rather add new levels, or have the player replay the level after update.

The first option is problematic in many ways. While having the trainer add in complete

training content for each level may make it easier for the learner as they do not need to repeat the training, it would not make sense to have similar content that belongs to the same topic in different levels, as the training content would feel fragmented. After all, the point of having different levels was to group similar content together and divide them into a way that makes sense. Therefore, it can be concluded that the second option is best to handle this situation. The trainer should be able to update existing training, and the players should receive a notification when there has been changes made to a level so they can complete it again.

The instant messaging app on the phone is not necessary to facilitate communication between employees. The role of the app is to provide space for the players to ask questions, and therefore a question board is a better option, according to the participants. Expanding on the idea, several things must be considered before replacing the instant messaging app with the question board to the game. Firstly, how should the answers be displayed? If there are multiple answers, then how can players know which one is more trustworthy, if the answers happen to contradict each other? An option is to allow answers to be rated by colleagues, and a participant thought that it could be a good idea to pin the "top" answer with the most "votes".

5.4 Changes after Game Concept Evaluation

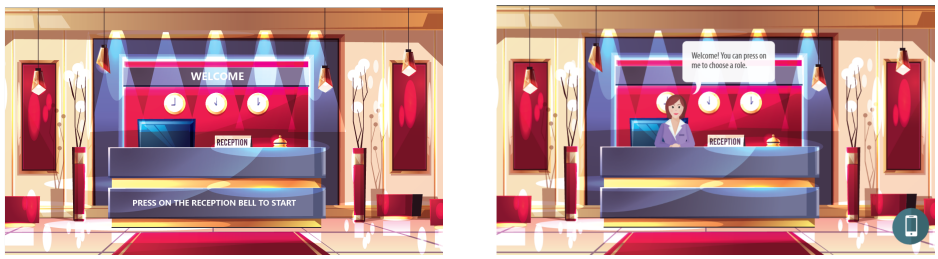
This section describe the changes made to the *GDPR At Work* prototype based on the results of the game concept evaluation. Each change was made with careful consideration, where the focus for review was whether the changes could bring *GDPR At Work* one step closer to being a solution that could answer the proposed research questions. Choices that can generally improve the user experience were also considered, as game features that negatively impact the user can decrease the engagement of the game. Explanations of the design choices that were not implemented will also be described later in this section.

The most immediate change to be made was to change the term "manager" to "trainer". The rationale that trainer sounded friendlier than manager made sense, and all the interview participants present encouraged this suggestion. By not using overly intimidating expressions, the player could feel more comfortable playing the game and in turn improve their experience. This change is accordingly reflected in the rest of the document.

Another change that was implemented was the addition of new NPCs. All the participants seemed interested in the idea of using such NPCs for the player to interact with. The existence of NPCs have also always been prevalent in role-playing games. Lin and Sun (2015) describe that in Massively Multiplayer Online Role-Playing Games (MMORPGs), NPCs can be used as background characters to create a more complex world, and at the same time also be used to give quests and to further the storyline. In both cases, the NPCs' roles can contribute to the player's feeling of immersion in the game world. We adapted this practice and created NPCs that can give the office game world a more realistic atmosphere to increase player immersion.

Two new NPCs were added into the game following this feedback: a receptionist and a colleague NPC in the meeting room. They have the purpose of relaying important information to the user, or in another word, to further the storyline in the game. This addition reflects upon Lin and Sun (2015)'s NPC usage description and hope to increase the engagement of the game.

The receptionist NPC addition can be seen in figure 5.1. The concrete change made in this addition was to exchange the clickable reception bell with an NPC instead. After interacting with the receptionist, the same screen where the player can choose their roles applies. This is displayed in figure 5.2.



(a) Old reception with reception bell

(b) New reception with receptionist

Figure 5.1: Addition of a receptionist NPC in the reception

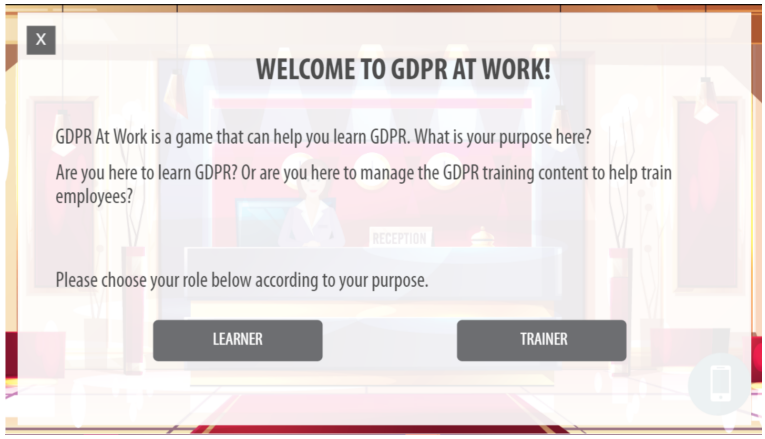


Figure 5.2: Choosing a role after selecting the receptionist

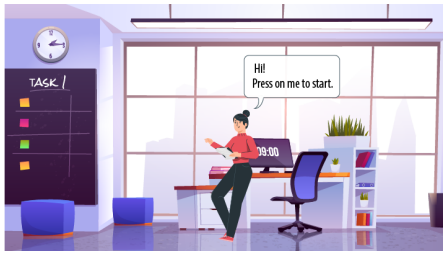
Based on the player's progress in the game, the receptionist will display different dialogues that give the player hints about the location of the next objective. This is the main way in which the receptionist NPC can serve its role to further the storyline; the player can consult the receptionist if they're unsure about what to do in order to progress. Figure 5.3

displays an example of one such guidance dialogue.

Figure 5.3: The receptionist has different dialogues to guide the player

A similar colleague NPC was added to the meeting room, replacing a floating button with a clickable character. Upon interacting with this new NPC, the player will gain access to the realistic cases just like before. This change is illustrated in figure 5.4.

(a) Old floating button to open cases



(b) New NPC that will handle opening cases

Figure 5.4: Addition of a colleague NPC in the meeting room

Changes were also made in the training room, particularly the timer logic in hard mode. The participants suggested changes to the currently punishing timer logic where each wrongly answered question would decrease the timer faster. The change is inspired by chess matches, where each correct answer would *increase* the timer by a few seconds instead.

There were a few suggestions that were taken into consideration, but ultimately decided to not be implemented as a change in this stage of the prototype. One such suggestion was the to remove the possibility of choosing a role in the reception (figure 5.2). It is true that this choice could impart a security risk if anyone could simply choose to be a trainer in the early stages of the game, and a different solution e.g. an extra layer of authorization is

definitely preferred. However, the actual authorization solution is very difficult to define. Different companies have different login systems, and it is therefore difficult to create a solution that can encompass all cases. The authors therefore chose to leave this matter open-ended. Should a company adopt this game into their training system, it would be best if the company staffs were the one to implement their own authorization system into the game. Additionally, since it is not so difficult to remove this choice from the reception in the final product, the choice screen was kept in order to illustrate the different roles the game can have in further evaluations.

The results section of this chapter discussed about the idea to exchange the instant messaging functionality out for a question board. The use case of this functionality was originally to be a way for the player to receive help if they had any questions while playing as well as facilitating knowledge sharing between players. After careful considerations, it appeared that both alternatives presented different set of problems when it came to fulfilling this use case. It was therefore decided that further evaluations were needed in order to find out what the players thought would be the best way to receive help in this game—whether they would actually need such a help functionality in the game at all, or would rather just reach out for help in person.

Chapter 6

Technical Implementation

This chapter describes the technical implementation of the game *GDPR At Work*, explaining the choices behind the design, chosen frameworks and technologies.

6.1 System Architecture

The game *GDPR At Work* is a web-based game that is publicly available for install at https://github.com/qaphan3007/gdpr-project. The game is meant to be played by employees in IT companies who are most likely familiar with setting up and running a Github project. Similarly, the choice of a web-based game is natural due to the nature of training in IT companies today. Previous research in the specialization project revealed that staff training is often done on an e-learning platform, often computer-based. Adopting the computer-based platform can therefore make the application more easily be integrated into existing training platforms.

GDPR At Work was implemented using Phaser 3, a free open source desktop and mobile HTML5 game framework. The framework offers WebGL and Canvas rendering across desktop and mobile web browsers, where the chosen programming language for development was Javascript. Due to its ease in compiling to iOS, Android and native apps, Phaser 3 is a fantastic framework choice when it comes to developing an easily exportable game.

6.1.1 Phaser 3

As there exists many game development frameworks, one must be prudent when it comes to choosing the correct framework that can best fit the needed purpose. There are many factors that can influence this choice. One should consider all the advantages and disadvantages of each framework, in addition to the limitations presented by their own available developing tools. One of the biggest reason Phaser 3 was chosen for this project was how fast and light-weight it is compared to a few other popular frameworks.

A more detailed list of Phaser's main strengths and weaknesses is presented below.

Phaser's strengths:

- It is free and open source.
- Relatively popular framework with an active community for developers.
- While often is updated with new content and versions, future updates will not break compatibility with current code which gives longevity to the developing app.
- Phaser is very beginner-friendly. This is done through abstracting many complicated math functions and instead offering readable components.
- Phaser's extensive tutorial and documentation, coupled with many widely available demos, also makes it ideal for beginners to get into.
- Doesn't need any external dependencies/libraries during development unlike many other frameworks that need additional imports for things such as time management or physics calculations.

Phaser's weaknesses:

- Separate components should be divided into different "Scenes" in Phaser, where every Scenes switch requires a completely new load of the life cycle. This means that all assets are reloaded into the game every Scenes switch, making it not ideal if the developer has many different scenes to work with. There is a noticeable delay when switching scenes as well which can impact user experience.
- The lack of a visual editor to aid development makes Phaser not as easy to use compared to a few other frameworks that has this support.
- It is difficult to handle relative objects in Phaser. For instance, drawing a rectangle object that has a size relative to the size of a text box is difficult if one do not know the exact dimensions of the text box.

How Phaser Works

A Phaser game typically consists of several different Scenes, each Scene having its own assets and logic. These Scenes are placed on top of each other in layers, and is activated or switched into when needed. There is typically only one active Scene at a time in a game; this is where the player interaction happens. Each Scene consists of three important life cycle methods: Preload, Create, and Update. Preload is used to load all the necessary assets into the Scene, where it may get initialized or drawn into the Scene in the Create step. Update is then continuously run in order to check for any input changes the player may make and re-render the objects in the Scene accordingly. This cycle is repeated every time a scene switch occurs by the required player inputs.

6.1.2 Other Game Frameworks

As mentioned above, Phaser was chosen after considering the pros and cons of many other existing game development frameworks. Unity is one such game engine that was previously considered. Unity offers many features for the user to create games both in 2D and 3D, including an advanced world renderer for 2D games, and user-friendly functionalities like drag and drop. It is also one of the most popular game engine used in the market, resulting in a huge and useful developer community. Unity is a very attractive choice, but ultimately was decided against due to the authors' computer limitations. Unity requires a fairly good computer to handle the program due to how huge the engine is when it comes to functionalities. This is completely different from Phaser which requires only a capable text editor. This is a huge reason why Phaser was chosen over Unity for development.

Another framework considered was GDevelop, another open source game creating software licensed under MIT just like Phaser. This framework is aimed at everyone, even people without programming skills. It therefore has an intuitive and easy to use visual editor that can give life to a game without programming. The whole process of making a game using GDevelop is to use this extensive editor coupled with its drag and drop function to define the different scenes, making it extremely easy to create a game. However, a few problems can arise with a such editor. Objects are predefined and is limited by the behavior the game engine willed it to be, which can severely limit freedom for the developer. This was the main reason why GDevelop was not chosen over Phaser.

Other frameworks such as GameMaker or Pixi.js were also considered. These were in the end not chosen over Phaser, as GameMaker is not free and Pixi.js only offers the renderer and not the complete solution like Phaser does.

6.2 Other technologies used

6.2.1 Firebase

Firebase Realtime Database is a cloud-hosted database service by Google, and was used to store and retrieve data in *GDPR At Work*. Due to its free pricing, it is an ideal database choice for the purpose of the current game. There is additionally an optional higher tier pricing if the developer needs to expand the storage space, which makes it very easy to further develop and expand the app. Figure 6.1 and 6.2 display the interface of the Firebase console, which is updated in real time when adding or deleting an entry in the database with our app.

The database was used to store almost all the text used in *GDPR At Work*, such as the learning content and the scenario description. This is to ensure that it will be easy to expand the current game with more training content so that it will be easier to integrate our game into a company's existing training programme.

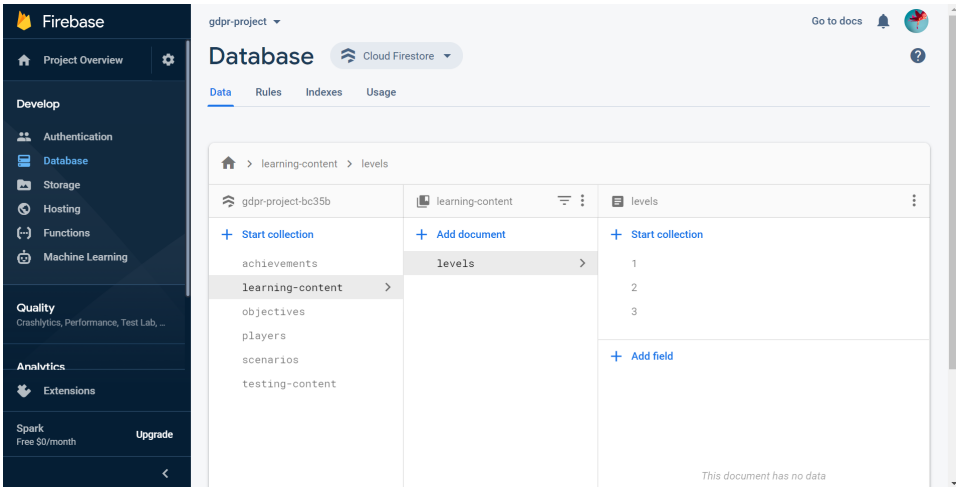


Figure 6.1: Using Firebase to store different collections

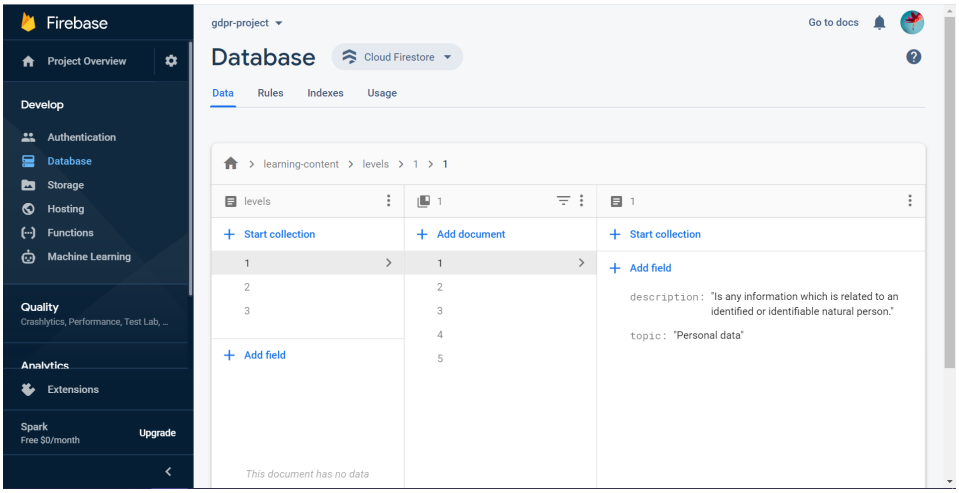


Figure 6.2: Example of a specific entry being stored in the database

6.3 Difficulties encountered

As mentioned above, Phaser was chosen over Unity as development framework mostly due to computer hardware limitations. Due to the COVID-19 pandemic, better equipment provided by NTNU could not be accessed. This ultimately severely affected the development speed of *GDPR At Work*, as the authors had to learn how to use a new framework as opposed to simply utilize their previous Unity experience.

As development began, several weaknesses of Phaser began to reveal itself. Section 6.1.1

described how Phaser handles different components through the usage of Scenes. This Scene system lets Phaser excel at physics-based game and games that do not require too many changes in display, but does not bode well for games where there are a lot of Scene transitions. *GDPR At Work* is a text-based game which requires many textual transitions in the game screen. It was difficult to decide how this transition should be realized in the Phaser framework. If the player is redirected to a different Scene every button click, the loading time would be too noticeable and can negatively impact the user experience.

Also mentioned in section 6.1.1 is the difficulty in creating objects to wrap around a block of text without knowing the exact dimensions of said text. This made implementing the envisioned learner tests difficult. The tests were designed to be wrapped by colorful rectangles which are fun on the eyes and can potentially increase engagement. It proved to be difficult to create tests that can automatically be retrieved from the database, as the length of the retrieved text was unknown which made wrapping the text in colorful rectangles difficult. For the same reason, this caused complications when it came to implementing the question board, especially if it was to be implemented on the small phone screen in the game. It was a problem on the trainer side as well: if the tests cannot be retrieved from the database and automatically displayed, there would be little point in letting the trainer create and save test data into the database. A temporary solution could have been to disregard the different types of tests in the initial design, but this was not done due to the possibility that the variety could lead to increased learner engagement. This was one reason why the trainer's side was not completely implemented in the final version of *GDPR At Work*.

While Firebase was easy to use and integrate with Phaser, it was not without fault. The structure of the database was decided before the development, and some problems were unexpectedly found during the later stages. As seen in figure 6.1, the learning content was stored in a nested structure, with different levels as their own collection. During development, there was a need to count the number of levels in the training room. The development was done with future development of the trainer role in mind, and therefore it was safe to assume that the number of levels is not a constant, as a trainer should be able to adjust the number of levels at ease, and this change should be reflected in the database. An attempt was therefore made to count the number of collections under the document "levels", however, this proved to be an impossible task. According to the documentation of Firebase, retrieving a list of collections is not possible with the mobile/web client libraries[1]. To count the number of levels, changes should be made to the current database structure to avoid nested structures. This was another factor that hindered the development of the trainer perspective in the game, as it would have been costly to change the current architecture of the database.

[1]Google Developers (2020). Firebase documentation. List subcollections of a document: https://firebase.google.com/docs/firestore/query-data/get-data

Chapter 7

Evaluation with Game Expert

This chapter describes the evaluation with a game expert of digitally implemented prototype of *GDPR At Work*, as well as the entire game concept. The prototype included changes made after the first evaluation in the form of group interview, with the focus on the learner perspective. Furthermore, a digital wireframe of the process of adding training content from the trainer perspective were created to be evaluated as well. This chapter will discuss the purpose of this evaluation as well as details about the process, and lastly discuss the results of the evaluation.

7.1 Method

Expert evaluation methods utilize the knowledge of user experience professionals in evaluating the UX of a system (UX, 2010). Not only the UX, experts may also evaluate materials such as product specifications or early prototypes of the system. Through expert evaluation, basic problems can be avoided early on, thus reducing the cost of changing the system in the later stages of development.

There are advantages in using expert evaluation. As mentioned, it can be used to identify basic problems early on, at the same time by focusing on user testing with smaller numbers of users, an expert evaluation can help identify which things to focus on in the next step of development. A downside can be that for such an evaluation to be done well, the feedback should ideally be from double-experts: usability experts as well as experts in the subject domain of the project, in this case would be game design. Another problem is the cost in finding the relevant experts for an evaluation. Furthermore, the results can be too challenging to handle, thus forcing the designers to make a decision when analyzing the results of an expert evaluation (Hall, 2017).

In this evaluation, a semi-structured interview with a game expert was conducted. This type of interview was previously done in the specialization project, and proved to be a good way to provide feedback. Expert evaluation is an open method and it allows to be

conducted through a semi-structured interview. It is an effective method for the expert to come up with new approaches and ideas by facilitating discussion. The game expert was chosen as the main resource for feedback prior to the final evaluation, to provide feedback on game elements and ways to engage players. The first prototype of the game presented in chapter 6 was presented to the game expert, as well as a wireframe of the part of the game that focused on trainer perspective.

7.1.1 Purpose

The motivation behind the interview with a game expert was to obtain quality feedback of the game design. While the results of the previous evaluation suggested that the game contained enough game elements, the participants in the group interview were not experts in game design, and gave therefore feedback based on the perspective of a player. In general, they provided few ideas on how to make the game more engaging. Therefore, there was a need to consult with a game expert to find out whether the current game elements were sufficient in engaging players. The purpose of the interview with the game expert was to get feedback on the current design and at the same time get ideas on how to make the game more engaging for players.

7.1.2 Process

The game components were gradually introduced to the expert by following the objectives in the game. After each component was introduced, the game expert were asked questions related to the component based on the interview guide to get feedback on each of them. Due to the nature of a semi-structured interview, it allows for discussion with the expert to explore side tracks, even while following the interview guide. This was the main reason why a semi-structured interview was chosen for the expert evaluation. It enables discussion about side topics that the interviews had not previously consider while not forgetting the main topics that need to be discussed. After going through the prototype, the expert was shown the wireframe that contained the process to add in new training content. The wireframe was developed using Adobe Xd[1], and can be found online through the following link: https://xd.adobe.com/view/09d23e01-e5d4-47ff-bfb0-1d22e8add14d-5c81/?fullscreen. This wireframe is a more detailed version of the wireframe previously used in the group interview, and concentrates only on the training room from the trainer perspective.

As a preparation for the interview, questions were created for each game component. The questions can be found in appendix C.1. Due to COVID-19, the interview was conducted through an online meeting using Zoom, similar to the group interview. Digital notes were taken during the interview to capture the most important point of the feedback. Zoom provides an option to record the meeting, but this was not chosen to respect the privacy of the expert.

[1] Adobe (2019). Adobe Xd: https://www.adobe.com/products/xd.html

7.2 Results

This section presents the results of the interview with the game expert. The interview guide was constructed to fully make use of their expertise in game design to gain feedback on each component and the game elements used in them. Therefore, the interview guide was divided into questions concerning the different components in the game, with focus on the design choices taken there.

The interview results were analysed using the *thematic content analysis*. This is an iterative process that consists of steps involving analysing the interview results, identifying themes with the data, and gathering together examples of those themes within the results (Burnard et al., 2008). Following this approach with the research questions in mind, several themes were identified.

Game concept

The game expert had a positive impression of the game concept. They thought that it was good to have different rooms as they provide a possibility to add in game elements to create stories and scenarios. However, they thought that the game currently does not take advantage of this space much. They also liked the idea of using a game to support GDPR training, as games are good tools to support a "boring" task. Generally, they thought that the game had a good starting point, but missed engaging game elements.

Methods to present information

The game currently present the information about GDPR in a text-based way. The game expert thought that it was difficult to follow due to the huge amount of text everywhere in the game. Both in the training room and the meeting room required a lot of reading, and therefore they thought that it was difficult to follow through all the text the way it was presented, and it is not exciting, which a game should be. *"Reading such a big amount of text is not exciting, and it does not stick to the mind."* Therefore, they suggested that it is better to be pictorial-based rather than text-based. *"In a normal context, videos, pictures or stories would be better. And the information that can be presented in a time frame should be dependent on feedback from the learners."*

Learning approaches

The expert thought that it was good to have a knowledge map. They thought that it would be good for the player to have an overview of the entire learning content, so they player can keep track of what is left to learn. Furthermore, the knowledge map can also provoke reflection by looking at what they have learned. However, they thought that it could be discouraging if there are too many topics to go through. They suggested to split the topics through micro-tasks, so that it becomes easier for the player to digest the information.

The main learning approaches take place in the training room and the meeting room through presenting text for the player to read through, followed by quizzes the player must

solve. The content in these rooms are vastly different, and the meeting room especially was meant to present a realistic case. However, the expert did not see much difference between these two rooms despite the differences in content. The same could be said for the feedback in the quizzes. While they thought it was good to have different types of quizzes, they thought that both learning approaches contained text-based reading, and therefore thought that it was difficult to comprehend the differences in content due to how similar they were presented. Due to the way the case was presented, they thought that the questions in the quiz afterward were not reflective enough.

Game elements to increase engagement

The expert thought that the game does not provide enough interaction through game elements. They thought that a game should be interactive, but the current game only allowed the player to click through a lot of text, and it was not supported by engaging game elements, and therefore did not feel interactive. *"Interaction through game elements does not happen much. There is no changing story elements so it does not feel like we are interacting much."* Furthermore, they thought that it was a good idea to create scenarios in the meeting room, however they commented that not much interactions happened here either. They could not see a scenario happening due to the lack of story elements.

To increase the engagement, the expert suggested to add characters with backgrounds and dialogues that can relate to the player. *"You already have NPCs, so use them. Give them more life by greeting the player when they enter the room, and ask them friendly questions about their day."* They suggested to give names and backgrounds to NPC as well, so it feels more like conversing with a real person. In the meeting room, they suggested to have the NPC explain the case. They thought that it would be more engaging to make a story about how the NPC is part of the project and use their role to explain the case in a friendly way by making it into a dialogue. Furthermore, they added that it could be a good idea to have the trainer add in new characters that may be related to a team in real life. This way, they can make some story elements.

Achievements were one of the main element used to increase engagement in the game. However, they thought that the current design does not make achievements seem very visible. While they thought that it was a good idea to use achievements, as players should have rewards, they did not think the way they are shown made it meaningful to the learner. Therefore, they suggested to have more rewards in the game. *"The game needs to have more chances to reward people with achievements in order to keep the motivation running."* They suggested to provide certificates that can be printed out. Furthermore, they suggested to have a high score list so the player can connect to other people playing this game and compare their results with. On this topic, they thought that trainers should also be able to define the achievements.

Other game elements

The game expert also commented on other game elements that did not support learning or engagement. They thought that it was good to have a reception that the player can always

come back to when they are unsure what the next step is. It provides a good guide for the player, and did not need more functionalities than it already have. Although, they suggested to give the receptionist more life by having friendlier and more personal dialogues.

When discussing the navigation of the game, the expert commended the concept of using a map to navigate through different rooms. However, they did not see the necessity in having so many apps. *"Maybe remove all apps and integrate only with one Map app."* They suggested that the achievements could be moved to a new room called a trophy or achievement room, where all trophies will be physically displayed on the screen. As for the objectives, the expert thought that they could come as push notifications on the phone when there is a new objective.

Integration

The expert commented that the current way for the trainer to define the learning content in the training room was sufficient. They thought that having the possibilities to add in content using text, figure and videos were enough, and did not think it necessary to include other media forms. However, they thought that it was important to consider how much a trainer can define a realistic scenario. The expert suggested to use interactive NPCs with engaging dialogues to create stories. However, this may be something that a trainer does not wish to do. *"What if they think it is too much work to add stories and characters in this way?"*

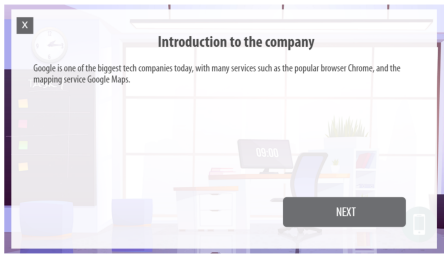
The game expert thought that it was important to consider how to link the trainer and the learner. They raised questions such as *"How can the trainer see what is going on and what the learner is doing?"* They thought that the trainer should be able to look at the training progress of the learners in order to assist them if needed. They suggested to add a trainer dashboard where the trainer may see the overview of the training progress of the learners, as well as provide a way to contact them in order to help them with learning if it seems like they are struggling. *"What happens if a learner needs to have all correct answers in a quiz to advance, and they failed five times? Or if they did not finish all contents in the game even after a long time?"* The expert suggested that the trainer can then look into their dashboard to see these problems and contact the learner to ask whether they need help or not. According to the expert, this is something that can be done to improve the learning experience of the learner, which is something the trainer considers important. *"The trainer will also benefit in that way."*

The expert gave a few suggestions on what such a dashboard could contain. Firstly, the learner should have a dashboard so they can track their own training progress. The learner dashboard could contain statistics for each level, such as time and number of attempts used to solve the quiz. It could also contain statistics about the scenarios, such as number of scenarios solved, which ones they chose to take first, as well as the time they took to finish the scenarios. The trainer dashboard should contain these information as well so they can offer help to the learner if they see that the learner is struggling. The trainer should also be able to see how fast the learner finished all training. The expert also suggested to send out questionnaires to the players after getting all achievements as a way to improve the game.

7.3 Changes after Game Expert Evaluation

This section describes the changes made to the game after receiving feedback from the game expert. Most of the feedback were based on the text-based nature of presenting information in the game, and these were considered to be the most crucial when deciding what should be changed in the game, as it directly affects the player engagement. Most of the suggestions related to the trainer, such as a trainer dashboard, were relevant to the game concept. However, as the implementation of the game only shows the learner perspective, none of them were implemented, and only added to the concept to be presented to the trainer through a presentation and wireframe. There were three main changes made to the game. Two of the changes were related to the meeting room, where the realistic cases were presented to the player. The last change incorporated more rewards for the player.

In the first change, instead of having the realistic cases presented in the meeting room through a text-based method, the case will instead be presented through a dialogue with an NPC in a "lunch room". The idea of using a lunch room were previously discussed with the participants in the group interview in section 5.2, where a participant suggested to have NPCs discussing about GDPR in the lunch room so the player may "overhear". In the new design, the player will be able to interact with the NPC called "Ada" in the lunch room, and the player will be tasked to help Ada with her case through the objectives on the phone. The idea was to have Ada present the case in a "friendly" dialogue and seek advice from the player. Figure 7.1 shows examples of dialogues with Ada in the game after changes have been made, with comparison to the old text-based design.



(a) Text-based case presentation

(b) Explain case through friendly dialogues with Ada

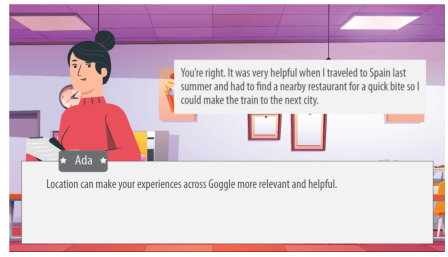
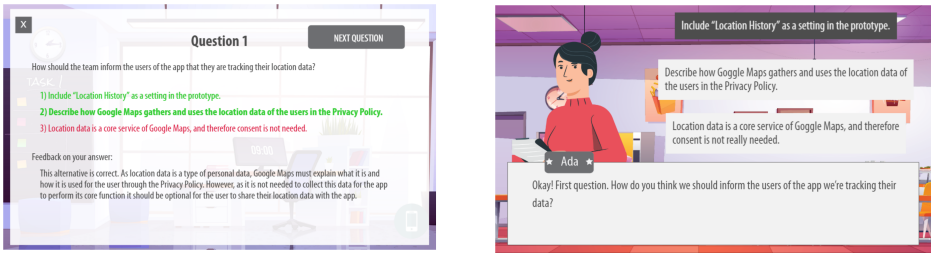


Figure 7.1: Changes in realistic case presentation

The case description was transformed into a dialogue form through Ada. As suggested by the game expert, using Ada to explain the case to the player will increase their engagement in the game. The dialogue will also limit the amount of text that can be presented at once, thus making it easier for the player to read and comprehend the case. Using the dialogue will also allow for more interaction, while using personal dialogue will make the player relate to the character better. Ada will seek help from the player to solve her case, and the questions in the original design will be transformed to options the player can choose to help Ada. This change can be seen visibly in figure 7.2. Immediate feedback is still presented in the new design, except the feedback was changed to a more "friendly" dialogue, in the same way the case was presented.



(a) Questions through a quiz with feedback after choice

(b) Questions posed as Ada seeking advice

Figure 7.2: Changes in the questions after case presentation

It is also important to consider the trainer perspective when discussing the realistic cases. When adding new cases, the trainer will first have to choose a character that will interact with the player. Then they will have to add in dialogues as well as options the player can choose from. The explanation of the case through dialogues should still conform to the framework to develop realistic scenarios in section 4.3.4. After the player has solved the case, the NPC will disappear from the lunch room, and a new NPC may appear in this room if the trainer decided to add more cases. The trainer may also choose to use the same NPC again to present another case.

The second change in the game will happen in the meeting room. As described, the case will be presented to the player through the lunch room, and the meeting room will no longer serve any purpose. Instead, a new room called "Ada's office" will emerge. The room will serve as a way to keep records of the cases, by keep a "case file" that the player may see after solving a case with an NPC in the lunch room. The case file will contain the case presentation from before the changes, in the form of text-based reading. The room will also contain an NPC, Ada's assistant Bill, that the player can interact with. Bill will point the player toward Ada in the lunch room if the player has not found Ada yet. Bill is also responsible for keeping the case files, and the player will be able to access the files by talking to him. Even if the trainer chooses to add in new NPCs, the player will only be able to access the case files through Bill. Figure 7.3 shows dialogue with Bill and the start of the case file.

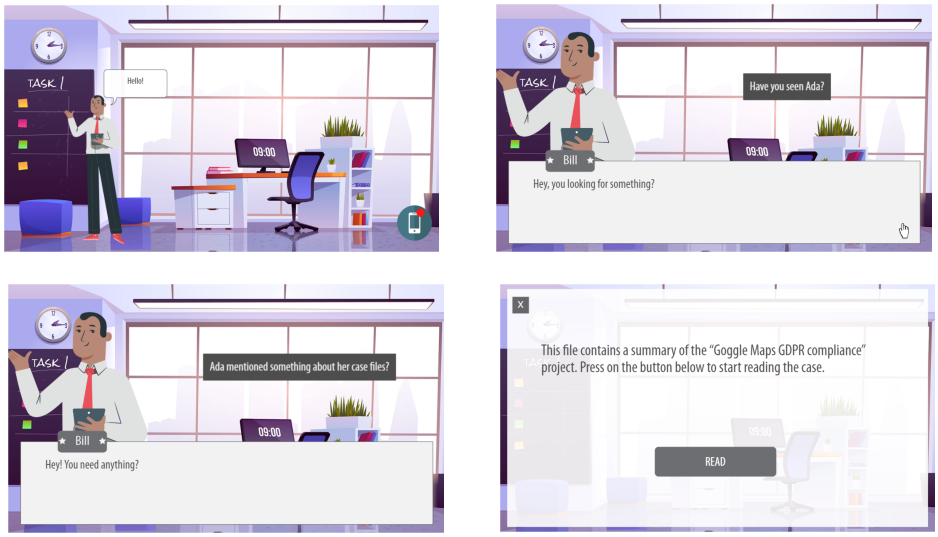
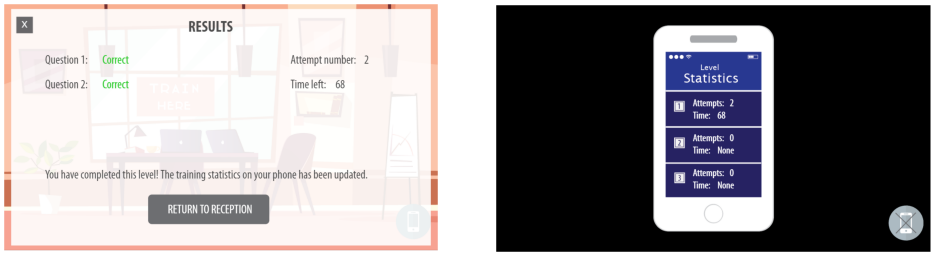


Figure 7.3: Dialogues with Bill in Ada's office

Lastly, changes will be added to help the player keep track of their progress. After completing the quiz in the training room on each level, the feedback shall also include information about how well they completed the level. As suggested by the expert, number of attempts the player made to complete the level, as well as the time leftover if the player chose the "Hard" mode. When a level is completed, the results will be saved on a new application on the phone called "Statistics". The application will help the player keep track of their results in each level in the training room, and will display the attempt number as well as time. The new statistics are shown in figure 7.4.



(a) Testing quiz result screen with more feedback

(b) Statistics app on phone

Figure 7.4: Changes with more statistics

In addition to the main changes described above, a smaller change was made to the training

room after careful considerations about the game's flow. This change was not made with regard to the expert's feedback, but rather from observations of how the game was played during the evaluation. During the evaluation, the authors presented the game in the way they thought should be played, but this play order could change if played by a player. As of before, the player was presented with the choice of whether to go through the learning part or taking the quiz directly when they prompt the first training screen. It was realized that this option can possibly upset the game flow if the player chooses to do the quiz before going through the learning aspect. This can result in the player having a higher number of attempts than needed, or possibly enable the learner to lose out on the learning part of the training room. A change was made to merge these two parts such that the player, upon starting the training, will first go through the traditional learning part before they can take the quiz.

The expert provided many suggestions on how to improve the game, however not all of them were relevant to the game concept. Their suggestion to change the icons on the phone was one such example. The expert thought that a phone should only contain one icon, and suggested to have all functionalities of the game inside the "Map" application. This does not conform with normal smartphone behavior, as a phone usually contains multiple applications even by default, such as "Settings", "Camera", etc. However, a trophy room can be considered as a good replacement for the "Achievement" application, as it provides room for more space to display the trophies or achievements instead of the small phone screen. However, this idea was not added to the game due to it not having a huge influence on the game concept.

The expert suggested to use a dashboard to track the training progress of the learners, so they can offer help if they see a learner is struggling to solve a task. This can potentially be beneficial to the game concept, as the last trainer requirement described in table 4.3 was to ensure that all employees have finished the training. This came from the interviews with employees responsible for GDPR training at an IT company, where they mentioned that their main focus was to ensure that all employees have finished the training to comply with the regulation. Therefore, it is uncertain whether the trainer would be interested in monitoring the training progress of individual employees, as it would require more work for them, especially if the company size is huge.

On the other side, while this is something that can be used in educational games, as it is normal for teachers to offer help to their pupils if they are struggling, it is not for certain that this will be perceived as positive for employees working at a company. Furthermore, having a trainer monitor their actions in the game may feel overbearing, and may ruin their game experience. If a learner has not done well in the test, they may feel embarrassed to share their results with another individual. Therefore, the idea needs to be investigated with the target group before deciding whether to add it to the final concept.

Chapter 8

Main Evaluation: Target Group Assessment

This chapter describes the final evaluation with relevant parties from the main target group through using the improved digitally implemented prototype of *GDPR At Work*. The prototype included changes made after the first evaluation in the form of group interview, as well as the second evaluation with the game expert. The description of the final game used in this evaluation that describes each scene and their apparent effect on learning and engagement can be found in appendix A. This chapter will discuss the purpose of this evaluation as well as details about the process, and lastly discuss the results of the evaluation.

8.1 Introduction

As described in the introduction in chapter 1.5, COVID-19 provided limited possibilities when it comes to evaluation. Based on the available resources, the final evaluation of *GDPR At Work* was decided to be an online assessment in the form of qualitative interviews with the target group, namely employees from IT companies. This evaluation will serve as the main data collection method in this research.

The choice of qualitative instead of quantitative research was partly due to COVID-19 preventing huge gathering and social distancing, but also due to the complexity of the game concept. As previously described, not all functionalities were implemented in the game, due to framework restrictions and limited resources. Therefore, it would be difficult to evaluate to game concept by quantitative methods, such as mass distributing the game and gather feedback from questionnaires. Rubin and Rubin (2011) compared the qualitative interviews to night goggles, which "permit us to see that which is not ordinarily on view and examine that which is looked at but seldom seen". Qualitative interviews can be used to deepen our understanding of a topic, thus possible to provide feedback that can be used for further development as well.

The final evaluation was held with five participants with different experiences with GDPR training previously. Each evaluation lasted around 45-60 minutes, where the participants first would be asked to play through the game by themselves, then followed by a discussion through answering interview questions. Both the trainer and learner roles were considered as potential interview candidates. Out of the five participants, four fitted the learner role and one of them fitted the trainer role.

8.1.1 Purpose

The purpose behind the main evaluation is to assess the game *GDPR At Work* as well as the concept of using this game to support GDPR training at IT companies. This evaluation aims to investigate the game's potential as an alternative to existing GDPR training, with focus on the learning and engaging elements to identify how well they will be perceived to the target group. The game is not a full-fledged application ready for distribution, but rather developed as a tool to illustrate the game concept behind it. Therefore, the evaluation will focus on evaluating the game elements and how they affect support the learning and engagement of players.

8.2 Interview procedure

According to Rubin and Rubin (2011), a research has to be carefully designed to obtain convincing results. The preparation procedure can be succinctly summarized with the following steps:

1. Pick an appropriate topic
2. Formulate research question
3. Choose how and where the study will occur
4. Choose appropriate interview respondents
5. Formulate interview questions

The first two steps are already done, and were explained in chapter 1 of this report. The topic corresponds to the main topic of this research. This evaluation will support in answering research questions *RQ1*, *RQ1.1* and *RQ1.2*. The last three steps will be answered through the following sections.

8.2.1 Process

The evaluation will consist of individual video meetings with each participant through Zoom, similar to the previous evaluations. The game will be running locally on the host's computer, their screen will be shared and the participants would play the game by controlling the host's screen.

The evaluation would differ based on whether the participant fit the role of trainer or learner. However, no matter which role they fit, the participant would be asked to first play through the game by themselves as a way to present the game concept. Explanations would be made as the participant progresses in the game, to further explain the game concept at the places where implementation was incomplete. The most important point to deliver during this process is that the learning content in the training room should be managed by trainers, and the content in the room at the moment only functions as a suggestion for how the training could look like to players. It is important to highlight that the trainer would be encouraged to use videos and illustration instead of text, as this would have a huge impact on the learning outcome of the learner.

For the learner, the evaluation would consist mainly of going through the game, which will then be followed by the interview. For the trainer, they would be asked to go through the game as a learner first. However, they would be asked to keep in mind their role as a trainer as they proceed through the game. Afterward, the wireframe that describes the process of adding in new learning content would be shown. This wireframe is identical to the one shown previously in the game expert evaluation. Afterward, a discussion will be facilitated through a set of interview questions, similar to the learner, though with different focuses.

Fontana et al. (2000) defined three different types of interviews. In this evaluation, the interviews will be constructed in a *semi-structured* way. It is a partially constructed interview that allows room to explore topics unplanned beforehand. Using this type of interview, it will be possible to explore new design ideas and receive feedback that can be useful for future work. This type of interview is also frequently used in qualitative research in information systems.

8.2.2 Participants

The evaluation included participants that can fill out the trainer as well as the learner role in the game. An overview of the candidates and the rationale behind the choices can be found in table 8.1. The evaluation was conducted with three students about to finish their master's degree in computer science, as well as two employees working at an IT company. Originally, it was planned to include two other employees working at an IT company to investigate the trainer role. However, due to unknown reasons, one of them did not reply to the initial contact attempt, while the other one expressed that they did not want to participate in the evaluation. Therefore, the final evaluation concluded with individual interviews with four participants that gave feedback on the learner perspective, as well as one participant that gave feedback on the trainer perspective.

The participants were selected based on how well they fit the roles in the game. For the learner, two groups of participants were considered. Firstly, the employees currently working at IT companies with existing GDPR training were considered, as they are the main target group if this game were to be used at an IT company. IT students that have gone through GDPR training while working during their studies would also fall into this group, as they can use their expertise to compare the game against existing training. As the pro-

totype focused on the learner perspective, the feedback from this group would be crucial to achieve quality results. An employee working at a company (IP1) as well as a student about to finish their studies (IP2) that fit into this group agreed to participate in this evaluation.

The second group considered to evaluate the learner perspective consisted of employees working at IT companies that have not undergone GDPR training. Similarly, IT students about to finish their studies were also considered a part of this group, as they would soon start working at companies when they are done with their studies. This group is also a main target group, as it is mandatory for new employees that will work at an IT company that requires GDPR training to complete GDPR training during the beginning of their employment. This group will therefore provide relevant feedback as potential users. Two students about to finish their studies (IP3, IP4) that have previously participated in the group interview agreed to participate in this evaluation. All participants with the learner role were in the same age group, all between the age of 20 and 30.

For the trainer, participants were selected based on whether they have participated in planning or management of GDPR training previously. Feedback from this group is important to the results of this research where integration into IT companies stands as one of the main focus. Their experiences working with making GDPR training would also be valuable in this evaluation. Three of the employees interviewed in the specialization project fitted this category, and attempts were made to contact them prior to planning the evaluation, but only one proved successful. This participant (IP5) has been involved in creating GDPR training previously through a GDPR compliance project. The trainer candidates ranged between the age of 30 and 50.

Role in game	**ID**	**Participants**	**Rationale**
Learner	IP1, IP2	Employees working at an IT company or IT students about to finish their studies that have gone through GDPR training	Share their thoughts on current GDPR training and compare it with training through the game, at the same time look at what they find engaging
	IP3, IP4	Employees working at an IT company or IT students about to finish their studies that have not gone through GDPR training	Share their thoughts on what they find engaging and investigate how well the game does in helping them learn GDPR
Trainer	IP5	Employee in charge of managing GDPR training at an IT company	Provide feedback on the game concept in terms of integration and management of learning content in the game, and share their thoughts on the engagement elements as older employees

Table 8.1: Overview of the participants in the evaluation

8.2.3 Interview questions

The interview guides for the learner and the trainer role would differ, as the focus of the evaluation for each of these roles are different. The interview guides for both of these can be found in appendix D.1. It contains the interview questions for the learner and trainer role discussed after the presentation of the game.

For the learner, the interview will be split into four parts: (1) integration, (2) engagement, (3) learning and (4) general questions about the game. It is important to consider how an integration of such a game into an IT company would affect the learners as well, therefore the learners will also be inquired about their thoughts on *GDPR At Work* as an alternative to existing GDPR training. Furthermore, the game expert suggested in the previous evaluation to include methods in the game to help the trainer monitor the training progress of learners. It is imperative to understand how the learners would feel about having such a functionality in the game. These will be the focus of part (1) of the learner interviews. Furthermore, the focus of the evaluation is to investigate how well the engagement and learning elements of the game works, and these will be the focus of part (2) and (3). The conference room was not implemented, but this idea will be presented to the participant during part (3) of the interview to investigate their thoughts on collaborative learning with their colleagues through the game. Part (4) will focus on finding their general impression of the game, and investigate whether this game is fit to be played at IT company. The interview guide for the learner will be mostly similar whether the participant have undergone GDPR training or not, except that the participants that have undergone training will be asked to compare the game with the existing training at their companies.

The interview guide for the trainer is divided into two parts: (1) integration and (2) general questions about the game. Part (2) contains questions identical to part (4) of the learner's interview guide. For the trainer, the focus of the interview is mostly about the integration of the game. The wireframe that explains how the trainer can add in learning content will be evaluated, as well as the framework used to develop realistic scenarios described in section 4.3.4. It was also important to find out whether they would be willing to add in a realistic case in the form of a dialogue through an NPC, as well as gather employees to perform collaborative training through the conference room. It was also interesting to find out whether they would be interested to monitor the training progress of the learners.

8.3 Results

This section describes the results of the evaluation with all participants. The interview results were analysed using the *thematic content analysis* method, similar to the previous evaluation with the game expert. All participants will be referred to through their IDs, and will be referred to using the singular *they* to protect their privacy by not disclosing their gender. The results from the interviews with the learners will be presented first, followed by the results from the interview with the trainer.

8.3.1 Interview with learner

Game integration to IT companies

The participants were asked about their thoughts on the integration of such a game in companies. They all agreed that having two roles in the game would be important for the integration. IP1 expressed that this is especially important if a company would like to do it their own way. Having the trainer role integrated with their own interface to add in new content would help to lessen the work needed to create new learning content. IP3 thought that it was *"smart to have the trainers customize the training room so the content is not static."* Both IP2 and IP3 mentioned that it would be good to have a trainer that can help out new players of the game if they are stuck. IP2 also mentioned that it could be helpful if the trainer can see statistics of the learners. IP4 thought that the trainer should not be gamified, and should not be a part of the game if there only role is to update the learning content. Especially, they thought it strange that the player can choose between the roles so easily in the reception as the first objective. However, they thought that trainer role is important, as companies would probably have existing trainers that would be responsible for setting up GDPR training.

The relationship between learners and trainers were also discussed. When asked about their opinions on sharing their results with the trainers, all of the participants seemed reluctant. They all agreed that they would feel slightly uncomfortable to be monitored in such a way, especially if they got less than stellar results. However, some of them thought it would be acceptable to share their results with only the trainer, and no one else. IP2 stated that they *"understand if trainer can see whether they have completed the training, but other information like how many times it took to do the test and how much time did they spent could be very uncomfortable to share."* IP3 thought that it would be okay for them, as they understand that GDPR is something they must learn, and it should be acceptable to be stricter about how the training should be done. *" It is similar to taking exams, only that you know the examinator personally."* However, they thought that it would be slightly stressed or embarrassed if a trainer contacted them directly if they happened to do poorly. IP4 agreed, and said that they did not want to appear "stupid" in front of the trainer. They thought that it would be acceptable for them if this is something everyone else must go through, and not only them personally. Furthermore, they thought that if a player could get some kinds of rewards for doing well, then they would be motivated to share their results.

On the topic of requiring help, the participants thought that it could be beneficial to have a method in the game where they can contact a trainer if they feel personally that they need help. IP1 thought that in a situation where they were unsure about something in the game, they could be uncertain about who to contact if they do not know a trainer personally, and it would be beneficial to have a "Contact Trainer" button somewhere visible in the game. Most of the participants agreed that they would prefer to ask for help inside the game, instead of personally contacting a trainer at their work place. IP4 thought that if the trainer is very easy to contact, for an instance if they work in the same building, then it would be easier to contact them directly.

While it is better for the learners to ask questions to the trainer inside the game, this could be time-consuming for a trainer if many learners happen to ask about the same topic. The discussion then steered toward the necessity of a question board in the game. All participants agreed that it could be good to have it as an assurance that they can contact someone if they ever need help. If there were already similar questions before, then they would not need to wait for someone to answer them. Both IP2 and IP3 highlighted that if such a question board should exist, there should be an option for the players to be anonymous when asking questions. IP4 thought that it may be cumbersome to formulate questions on the board, as GDPR is a very complicated topic. Therefore, if possible, they would like to articulate the words orally instead by contacting the trainer directly. If this is not possible, then the question board would be a sufficient alternative.

It was also interesting to find out whether the game can be played at home or at work, as this concerns the integration of the game into the lives of learners. IP1 thought that it was good to have the game available to play whenever and wherever, so they can choose to play it when they know they have the time to. IP2 expects this to be a time-consuming task, but they would be willing to split the time spent on the game at work and at home in half. IP4 answered that the game is not engaging in the typical ways games are engaging, but not so boring that it is unbearable to play at home. They thought that it was important to divide the line between work and personal life, and commented that *"it feels a bit cheating to play a game at work."* Generally, the participants agreed that they would not be negative toward the idea of playing the game at home as the game was engaging enough, as long as they get paid. They consider GDPR training to be a part of their work, and therefore would not willingly go through the training outside of work otherwise.

Engagement aspects

All of the participants agreed that the game was interesting. Most of them commented that it was fun to have the freedom to explore the different rooms. They liked that they were not confined to complete all training in the training room, but rather have the freedom to choose to read the realistic case after completing one level. All of them were enthusiastic about the conversation with Ada with the lunch room, and expressed that this was the most engaging element in the game. They thought that the dialogue was fun and personal, and felt realistic like talking to a colleague at work.

While learning about GDPR in the training room was not engaging, all of the participants understood that due to GDPR as a topic, it was difficult to make it engaging. IP4 thought that the environment around the training room, such as the quiz or the exploration, made it less boring. *"If we compare this to traditional GDPR training then this is way better."* Generally, the only engaging element they found in the room was the different quiz types. IP3 commented that the use of quiz can help engage the players, especially when paired with points which can ignite the competitive spirit in each individual. *"Players would like to get as many points as possible."*

When inquired about the element they found most engaging in the game, most of the participants immediately answered the dialogue with the NPCs. They thought it positive to include a concrete example of how GDPR can be used, and the way the case was presented through dialogues with NPCs was very interesting. *"The dialog made it engaging, talking to someone and choosing options and getting feedback based on their choices make it easier to learn and connect with the game. The dialogue was very personal and natural."* IP2 said that the dialogue made it easier to follow the conversation, and did not think it was too long. IP1 disagreed, and thought that there was a little too much text, which made it easier to drop out of the conversation while talking to Ada. While they thought that it was positive with the concrete example, they thought that it could have been explained through a smaller speech bubble with less text.

IP3 was slightly more interested in the quiz at the training room than the other participants. For them, this was the most motivating element in the game. Their immediate goal when playing the game was to complete all the quizzes with the best possible scores. The game expects the learners to get all correct options on the quiz to advance to the next level. When IP3 saw that they had answered a question wrong, they said that they would retry until they got everything correct, even if the game did not expect them to do so. For them, individual performance was the most important factor when playing a game. Their other goal would be to get all possible achievements in the game.

IP4 was mostly interested in exploring the game. *"It was nice visiting different rooms and talking with various NPCs, and the graphics are very pretty."* They commented that if they continued to play, they would be quite interested in gathering achievements. Although they commented that it would have been more compelling if the achievements were more visible somehow. *"Maybe have their own office where they can hang up trophies or have it on display."* They also really liked talking to Ada. *"If the entire game was about talking to Ada, then I would be very happy."* They thought however that the dialogue with Ada was slightly stiff, and felt like talking to a tutorial character. However, they understood that making the dialogue less stiff was difficult. *"There is a limit to how easy you can make the text when it comes to legal information."*

The participants were also asked to compare the game against the existing GDPR training that have undergone previously. IP1 thought that it was a different approach compared to the usual training method. They thought that it was more motivating to be able to explore different parts of the game, instead of having a repetitive task like the GDPR training they went through. *"It was more fun to go around and explore instead of having to go through a monotone set of videos and quiz like the normal training."* They thought that the most boring part of the existing training was how repetitive and time-consuming it was. They would have liked it better if there were less text and videos to go through. In general, they thought that the game was more engaging and more interactive, and more interesting and less monotone than the existing training. IP2 also expressed similar opinions. Furthermore, they thought that it was more interesting to see the different types of quiz, as it does not contain identical structure all the time. They really liked the realistic cases as well, and expressed that they would prefer to play this game instead of going through the

normal training, even if it takes more time due to the realistic cases in additional to normal training content.

The concept of the conference room was briefly explained to the participants during the interview, to discuss the possibility of introducing collaborative learning to the game. The participants seemed positive about the idea, as they have participated in such a situation before, most notably through the use of Kahoot! IP3 thought that it was a very good idea, and would introduce a different feeling than to just use Kahoot!, if the conference room was to be a part of the game. *"It is nice to learn together with other people, I would be motivated to know that I am not the only person who must go through this boring training."* IP4 also thought that it would be a nice activity to do with their colleagues, and would prefer to play with new colleagues when starting at their job soon. *"It would be more engaging to sit down and watch the videos and discuss the questions and find answers together, or go through the Kahoot!-like activity together."* They thought that it would be especially good to be able to play the game together with others, but they found it good to play the game alone as well.

Learning aspects

The participants thought that the content in the game was very relevant to GDPR training. IP1 and IP2 who have undergone GDPR training previously remembered learning about some of these content before. Furthermore, all participants agreed the learning content displayed through Ada was very relevant to the topic.

The participants all commented that it would be better to use videos instead of just text at the training room. *"Too much text makes the player lose track of things."* IP2 thought that the idea of watching videos followed by answering a quiz as the training method was good. The training they have done previously was also in this form, and they generally did not have a problem with it. While it was boring, they understood that this was a necessity. IP3 thought that the training room provided a good build-up to the entire GDPR training process. They thought that the training room *"is not be so bad as long as there is not a lot of text involved."* They thought that it was good to have quiz right after. The training done here is also a good build-up to the realistic case presented through Ada. IP4 commented that it is more interactive with the quiz, and would definitely prefer it over regular GDPR training.

The knowledge map was well-perceived by the participants. It was positive that they could see how much training is left and track their own progress through this map. It provides also a good overview of all the topics, and several of them mentioned that it would help them remember the topics better as even a glimpse of the knowledge map will help them repeat what they have learned previously. IP1 thought that it was very good to see their own progress and levels, which they could not see during the training done previously at their company. *"The training felt endless as we could not see our progress. The end of the training came very sudden."*

In the knowledge map, IP2 and IP4 thought that level 2 contained significantly more topics than the other levels, and was a bit surprised and intimidated by it. IP3 thought that this map would help them remember the training content better. *"Looking at this not only give an overview, but also give the player flashback to the training room when they first learnt about the topics."* They thought that the repetition from repeatedly reading the map after completing each level will help them remember better as well. IP4 thought that the subtopics on the knowledge map would help them have a control over what they have learned. *"While reading the knowledge map, there were instances where I thought "Oh I have learned this one" or "Oops I forgot that one", and it was a fast way to indicate that I should perhaps repeat this level."*

All participants agreed that it was good to learn GDPR through the use of a realistic case through Ada. They thought that it was a good way to help the learner remember better, as the dialogues were fun and memorable, as well as interactive. *"There are a few things about GDPR that are very abstract, and this case is very nice since it shows the application of GDPR. It also make the player remember better, since it's important to reflect over real life scenario.'* IP1 mentioned that it was good to have a concrete example, as it *"makes it easier to connect the GDPR knowledge learned through training to your own situation when you already have knowledge about an actual concrete context."* IP2 agreed, and thought that this could be valuable in real life. *"If we were to be put in a project related to GDPR, maybe it will be easier to work if we have this experience from before."*

Some participants also compared Ada's dialogue against the case file that can be read through Bill. They thought that it was good to have a reminder with less text through the case file, but would prefer to talk to Ada about the case. IP2 mentioned that the case file had a lot of text, and *"if there was only a block of text with quiz at the end then maybe there is no point to the game."* They would not think that they would be learning much if they were to learn about the case by reading the case file.

When it came to the discussion of collaborative learning through the conference room, most of the participants expressed that they would not mind going through the extra training. IP4 would be starting a new job soon and expressed that they want to understand the topic completely and would not mind going through the extra learning step. *"I would not want to mess up in my new job."* IP1 have undergone GDPR training previously, and mentioned that they did not do the training alone, but rather together with their other colleagues starting at the company at the same time. *"Doing the training together gave people a chance to discuss the topic if they were on the same question."* IP2 thought that whether they would want to participate in this extra training or not depends on the types of questions or topics that will be discussed. While they thought that it could be good for people to meet up and learn together, some of them may think it unnecessary to meet up extra after completing the game. They thought that it would be better for everyone to complete the GDPR training individually when they have time.

General impression of the game and game concept

All participants thought that the game was easy to play, as well as navigate, though some of them had some difficulties navigating the game in the beginning prior to finding the "Map" on the phone. IP1 thought that *"the game was pretty easy and straightforward."* IP3 thought that the game very intuitive, as they received many feedback during the game. It was not difficult to understand what the next step would be.

When asked about their general impression of the game, all of the participants replied positively and mentioned that the game was visually stunning, and easy to play. IP1 liked the style of the game, and thought that the game was *"very pretty with cool stations."* IP2 thought that it was easier to go through the game as it was nice to look at. They also expressed that the nice graphics encouraged them to explore the different parts of the game, as they were more curious to see how things would look like in other parts of the game. IP3 mentioned that if the game was ugly, it would have affected the general impression of the game by a lot, and they would not become excited and may not enjoy the game in the same way. IP4 used words such as "modern" and "fresh" to describe the graphics as well as interactions with the NPCs. The participants did not have much negative feedback regarding the general impression of the game.

The participants also thought that the game was very engaging and interesting in general, even in comparison with existing training. They agreed that this game provides a different, albeit positive way to complete the "boring" GDPR training. The game was interesting due to the different elements and how well they played together, such as the quiz, dialogue and case. IP3 thought that it was fun to play, and mentioned that it would be better to learn through the game rather than sit and listen to GDPR lectures. They expect training to contain various lectures, and felt that it was good to have the freedom to choose what they want to learn and when they could do it inside the game. *"It is better than having your boss force you to learn by informing you when the GDPR lecture would take place and ask you to attend it."* IP4 also thought that GDPR training is not something most people would look forward to, but if this game is used instead of traditional training then they think it would be more fun and engaging. *"The interactive elements make it feels like playing a game, which is often associated as a fun activity, and less like training, which can be boring."*

The participants reacted positively when asked about their thoughts on the game concept. All of them thought that it was a good idea to use games as an alternative to GDPR training. IP1 expressed that *"GDPR is dry, but it is important to know about it. Making the learning fun and memorable would be really good as people would remember it more afterward."* The rest of the participants also thought positively about how the game makes it more fun and engaging when it comes to learning. IP3 mentioned also that the learning tools used today generally uses more and more of gaming elements, and thought that *"GDPR and gaming fits well together"*. IP4 thought that the interaction was what made the concept shone through, and said that they would like to see more dialogues in the future. The engaging elements in the game makes it possible for employees to consider going back to and repeat training, thus helping them to remember the materials better. *"Right now*

people finish the training and try to remember it afterward, and would not voluntarily go through the training again. But this is nicer as it feels more lightweight, relaxed and fun to do unlike traditional tests."

All of the participants agreed that this game is something that can be played at a company. Some of them thought that this game absolutely can be used not only at IT companies, but anywhere where GDPR is relevant, as the game is not especially difficult and is very open. IP1 thought that there was no reason why this game cannot be played at companies, as it has many elements to support integration, not to mention it also also provide an alternative training that is more engaging for the learners. Furthermore, they thought that the graphics were professional enough to be used at a company, and this would not be a problem.

While on this topic, some of the participants also discussed possible demographics for the game. IP2 thought that the game may fit the younger generation better, however this may also be interesting to the older generations as they think that many employees working at IT companies have played games before. IP4 thought that the game would fit perfectly for newly hired employees, as it can serve as a bonding exercise for them to play the game together. While they think there is a slight risk of adults not interested in playing the game, they also thought that if the game is played at an IT company then it would most likely not be a problem. They thought that employees at IT companies are more prone to liking games due to how close they work with technologies.

Other comments on usability and design

Usability was often a topic of conversation when asked about their general thoughts on the game. The participants all agreed that the game has high usability, with good feedback, making the game easy to play. IP4 commented that they felt unsure whether they need to complete all levels in the game in order to complete training, and recommended to add more explanations about expectations and requirements somewhere in the beginning of the game, with clear statement about what must be done so that the training can be considered "finished" by the trainer's standard. However, there were some parts in the game that were difficult for them to understand. IP3 did not understand where the numbers displayed on the "Statistics" app on the phone came from. However, they thought that if they were to complete all levels then they would most likely understand. IP1 was slightly confused in the beginning of the game after reading the second objective, as they did not understand that they can navigate through the "Map" app yet.

The participants also commented that it was difficult to understand where to press on sometimes. This was due to the video being shared through Zoom that was slow, and thus the cursor did not immediately update to a pointer when the participant hovered over a clickable button which made it difficult to see what is the correct thing to press on. The response time it took until the participant's screen was updated after clicking on buttons were noticeably slow due to the remote video sharing, however none of them thought that it was slow enough to ruin the game experience.

IP3 and IP4 misunderstood the levels in the training room while reading the knowledge

map, and thought that the levels indicated difficulty levels, so the higher the level, the more complicated the topic. This was not expected, as the levels were meant to divide GDPR into different parts. The use of the term "level" in games often indicate a higher difficulty as the level increase, and both of them thought so. IP3 especially did not understand what the numbers on the knowledge map indicated. They thought that it would be better to make it more obvious that each level is different, and suggested to include elements from Super Mario where you can move through the level.

8.3.2 Interview with trainer

Game integration to IT companies

IP5 praised the concept of having different roles in the game. *"It was absolutely fantastic that the game allows a role that can change the learning content, as the game could then be used in different companies. This would not have been possible if the game came as a complete package that cannot be customized."* An important part of their job when they assisted in creating GDPR training was to adjust the learning content for employees with different roles, and having a trainer role in the game would allow them to customize the training in a way they would need. They thought that they would have utilized the ability to change the learning content and customized the training so employees do not need to look at the parts that are not relevant for them. They also had positive feedback on the way a trainer can add in a new training level after looking at the wireframe. They thought that the interface to add in new learning content and quiz it was intuitive after playing the game themselves.

They thought that the game concept was flexible to be played in various settings. They would prefer to play the game whenever they have time, and commented that most employees have a distinct separation between work and private life, and would therefore generally not consider to play this game outside of work hours. However, they thought it was positive that an employee may play this game alone at their desk at work or together with other colleagues. *"It can be a good idea to take the game to for example a department meeting, and use it to quickly test some knowledge together."*

As a trainer, they expressed that it was important for them to know when a learner have finished training. However, they thought that it would also be interesting for them to see how well the employees have done in training as well. They understood also that if someone have received good score under training then they would be willing to share, however they would be reluctant to share if the opposite were to occur. Therefore, employees can be encouraged to show their results to others, but they should not be forced to.

Realistic cases

When it came to how the dialogue through Ada was presented, they thought that it seemed like an easier way to help understand GDPR as a "simple and down-to-earth" example was used. IP5 was asked to play the game as a learner first, and they thought that it was engaging and fun, as well as educational. *"It was a very nice and easily explained scenario,*

where everyone could relate to." They also thought that the way the case was explained was very pedagogic and easy to understand. While talking to Ada, they compared it to their experience working on a project previously to help a customer with GDPR compliance. *"I was exactly like Ada in this case when I worked with the client."* They also had discussions with their colleagues about what to do to comply with the regulation during coffee breaks. Therefore, the case was extremely realistic for them.

The case file with Bill was used to illustrate to the participant how such a case was developed. They first though was that the dialogue seemed so natural and so easy to understand that they did not think there was such a thoughtful order behind it. They thought that the order used to explain the case had a natural flow, and did not see anything wrong with it. Especially, they mentioned that it was good that the explanation starts with a description of the fictional company.

When asked about whether they would be willing to create realistic cases through the use of dialogue, IP5 answered enthusiastically. *"Creating a case in such matter would have been extremely fun."* They thought that since the case was very engaging to go through, they would not mind recreating the same experience so others can learn in this way. They even suggested a potential NPC with a specific personality that they would like to create, and expressed that it would have been fun to have more NPCs with different roles in the same project currently described in the game by Ada.

General impression of the game

The participant had a generally positive impression of the game. *"It was fun and motivating. I wanted to continue playing it."* They thought that it was better than the standard training. IP5 also thought that the game looked *"fancy, great and delicate"*, and it had a lot to say for the game experience. At the same time, they thought that while the design was excellent, it alone did not have much to say about how good the game is. Rather it was the quality of the game content that made it as good as it was. IP5 thought that the content in the game currently was very relevant. They also thought that the game would absolutely fit to be used at IT companies, and thought that it should not matter what age group the player is in, as it was extremely easy to figure the game out in a short amount of time.

8.4 Discussion

8.4.1 Research method

The assessment with the participants occurred through using the online conference tool Zoom, where the host had the game open on their own computer, and let participants control their screen. This was not optimal for this evaluation, due to the slow response time when controlling the host's screen that could have potentially ruined the game experience. The most optimal option would be to host the game in the Cloud and send the participant the link to the game online prior to the evaluation. Attempts have been made to host the

game on Firebase, however, this failed as for unknown reasons the images in the game disappeared after hosting on the Cloud. Video sharing with the participants controlling the screen of the host was therefore the only option in order to complete the evaluation.

The evaluation was planned with participants that could fill out the learner as well as the trainer role. It can be discussed whether the feedback received from the trainer was representative, as only one trainer candidate could participate in the evaluation. However, as they have worked previously with creating GDPR training, their feedback was valuable. It was difficult to get into contact with employees working in the industry without prior connection and other means of recruiting.

8.4.2 Interview results

Integration to IT companies

The participants expressed the importance of having different roles in the game in order to *customize the training content*. Both the trainer and learners consider it to be a necessity in order to distribute the game to different companies, as each company may have their own focus in training they would like to work on. The trainer did not see any specific problems with the way they can add in new learning content shown through the wireframe, and also would not mind adding realistic scenarios through NPCs inside the game, due to how engaging they thought the dialogues were. They would not mind investing effort into making a case in the form of dialogues as they understood the positive affect it can have on the learners.

After the evaluation with the game expert, several design ideas arose that required further investigation to see if they would fit into the game concept. One such idea was the addition of trainer dashboards to monitor the training progress of players. Several of the participants did not think they would like to share their results if they got less than stellar results, while others thought it would be acceptable if it was a necessity, and even then would only share their results with the trainer. The trainer would not mind monitoring the training process of learners, but also felt that it is necessary to do so.

Learning approaches

Chapter 4 described the game design of *GDPR At Work*, and summarized the game components and how they affect learning in table 4.4. Some of the components were changed after multiple evaluations, but the main idea behind the purpose of the components remains unchanged. The main source of learning in the game were originally planned to happen through the training room, meeting room, conference room and instant messaging app on the phone. After several evaluations, the components changed to the training room, dialogue with Ada in the lunch room, conference room and question board on the phone. The participants in this evaluation were tasked to answer questions regarding how well these components work in supporting GDPR training.

The *knowledge map* in the training room was perceived positively by the players, as it was helpful in several learning aspects. It provides an overview of what they need to learn, help them keep track of their learning progress, as well as help them in learning by encouraging repetition. The players thought that the knowledge map made it easier for them to remember the learning content.

Of all the learning approaches in the game, the players agreed that it was the presentation of a *realistic case* that was the most educational. The trainer compared it with their previous experience where a similar situation occurred, and it was clear how the case provoked reflection for them. All of the learners have praised the realistic case and expressed that they would prefer to learn using this method instead of traditional knowledge transfer. The learners all thought that the realistic scenario created a situation that the player can easily relate to, and the case helps the players reflect upon what it entails for them. They also thought that due to the interesting case presented through dialogues with an NPC, it would help them remember the case better as well, thus increasing the learning outcome.

On the topic of *collaborative learning* through the conference room, the participants had divided opinions. Some of them do not think it would contribute to their learning, and do not want to spend more than necessary time on it. Others thought that it would be a good opportunity to get to know their colleagues, and thought that it could be valuable to facilitate discussion which could help them in learning GDPR.

Engaging and motivating elements

Table 4.4 also describe the relation between the game components and how they affect the player engagement. In the evaluation, all of the participants agreed that the most engaging element in the game was presenting the *realistic case* through *NPC dialogues*. The initial prototype of the game presented in the game expert evaluation also contained a presentation of a realistic case, however due to the text-based presentation of the case, it was not as engaging as intended. A participant also commented that there was no need for using a game if the entire game play consisted of watching videos, reading and completing quiz. The dialogues with the NPCs was engaging as it helped the players relate to the characters and was generally more interactive, which helped to keep the focus of the players throughout the case explanation.

Rewards through *achievements* and *statistics* after completing time-based quiz were also a game element that the players thought were motivating. Some players wanted to continue playing in order to achieve the best scores in the quiz, as well as collecting all possible achievements. Some of them did not think these elements were very visible in the current design, and suggested to make them more visible through for an instance an achievement rooms with trophies for each achievement the player has achieved.

The players also found *exploration* to be engaging in the game, which was partially facilitated through the objectives and the guidance from the receptionist NPC. The game gave the options to choose whether to complete the levels in the training room, or explore the game and talk to different NPCs to discuss the case. This was perceived as positive in

their eyes, as learning GDPR in the training room alone may be boring, and they had the options to explore other parts of the game in between the boring experience and continue to engage in the game, which could encourage them to finish the training. Furthermore, the players were encouraged to explore the game due to the *visually appealing graphics*. Some of the participants mentioned that they would not have such a good impression, and would not feel as compelled to explore the game unless it was aesthetically pleasing.

Target age group

There was a divide between opinions about who the game is relevant to. Some of the participants were students about to finish their studies and start working at IT companies, and therefore considered the game to be a good tool to bond with their new colleagues. Some of the participants were slightly concerned that the older generations would not like the idea of playing a game at work. However, some of them would not think it would be a problem due to the simplicity of the game. Several employees belonging to the older age group were contacted prior to the evaluation, however none of them ended up participating. Therefore, this was a difficult topic that needs further investigation.

Chapter 9

Discussion

This chapter aims to compare the results produced across all the evaluations of the game *GDPR At Work*. These evaluations can be found in chapter 5, 7, and 8. Since each chapter contains its own discussion section where the results produced from each evaluation is discussed in details, this chapter will only seek to compare the results across the chapters and not go into details on the different topics.

The main focus the evaluations had were on the game integration and possible game elements to increase learning and engagement. After summarizing the gathered results, we present a table that lists up the possible game elements a serious game that aims to support staff training could contain.

9.1 Game Integration to IT Companies

All the participants across all evaluations have expressed positive thoughts when it came to the idea of using games in organizational staff training. One of the reasons why they thought so was due to the realistic concept and how easy it was to relate to. This remained true across all development stages of *GDPR At Work*, with the final evaluation bringing the most enthusiasm to the idea. Many participants thought that the game was interesting to play, and that if such a game replaced their current training system, it would make the training better.

Another factor that made *GDPR At Work* seem so easy to be integrated in a company was the focus on flexibility and configuration. The literature review performed in chapter 3 revealed that key elements to integration serious games into companies were the degree of flexibility. In *GDPR At Work*, this was implemented by having a distinction between the "learner" and the "trainer" role, where the trainer have access to modifying the training content. This proved to be an important detail. In the main evaluation with an employee who had the trainer role, the ability to customize the training content was repeatedly praised. An important requirement that a serious game should have when it

comes to integration to companies is therefore derived to be flexibility such that different companies can adopt the game and customize it to fit their own training.

9.2 Learning Elements

The main learning approaches that *GDPR At Work* take are through the use of quizzes, traditional knowledge transfer and realistic scenarios, with quizzes already identified in the specialization project to be an effective learning tool. All of these elements were implemented and tested in the evaluations, where the realistic scenario approach was the most positively regarded by the different interview participants. This element was also discovered to be an important element to include in a serious game that supports learning in the state of the art, where Petersen and Ekambaram (2016) remarked that "recalling previous experience makes it easier for a person to make a decision in future similar situations". Reflection was also identified to be an important element to have in the game in order to support learning, and many participants thought the realistic scenarios were especially reflective.

The traditional learning approach, as opposed to realistic scenarios, were not received too eagerly as it resembles a lot to the training the participants have gone through previously. However, the participants thought that the use of videos instead of pure text would immensely help with the experience and understood the necessity of this element.

The knowledge map in the training room was also regarded positively in that it helped the player in keeping track of their own progress. However, this may be difficult to implement in other serious games with the aim to support staff training. *GDPR At Work* is a level-based game with sequential progression, which made it easy to be divided into different levels and create a level-based knowledge map. Other games with more focus on emergence exploration or with a lack of a centralized learning station like the training room may not benefit from the knowledge map.

9.3 Engagement Elements

Some engaging game elements that were found to be useful were time-based quizzes, achievements, dialogues, exploration and collaboration. A participant in the final evaluation described the quiz to be the most engaging part of *GDPR At Work*, where they felt motivated retry the quizzes until they got all answers correct. Such motivation stems from the feeling of challenge provided by the quiz, as described by Darban and Polites (2016). The variety of quiz types were remarked as a positive addition to the quizzes, where the expert evaluation revealed it to be important in order to refrain from using too much text-based learning.

Achievements were recognized as an engagement-increasing game mechanics by many participants, as well. A few improvement suggestions to *GDPR At Work's* implementation of the achievements could be to make it more visible, such as presenting it in a trophy

room. This mechanic, when implemented in other serious games to support organizational training, should therefore be designed in a way to make it more visible and contain more rewards for the player.

After receiving feedback from previous evaluations that *GDPR At Work* did not contain enough interaction with the player, NPC dialogues were implemented for the final evaluation. This functionality seek to create more interaction between the player and the game characters, and received vastly positive feedback from all final evaluation participants. This game element is therefore identified to be imperative in a serious game that aims to support training in that it can help transforming boring factual text into a fun simulation and aid the learner in digesting a huge amount of information.

Another engagement-increasing game element was identified to be exploration. This element reflects on the emergence game environment design which gives the player freedom to explore what they wish to explore. This was positively received by the participants because it offered them a chance to take a "break" from the traditional learning room. They described that the chance of pace made the experience less monotone. In order for this game element to work, a serious game should contain different learning environments similar to *GDPR At Work*. These environmental changes can provide variety in gameplay which can engage the player.

Cooperation as a game element received mixed responses from the participants. The implementation of this element was done through the conference room, but it was revealed that not all participants were willing to go through this extra learning step. Despite this, some participants thought that it would be fun to play the game not as a single-player experience, but together with other players as they go through the learning parts together. They explained that this could bring forth discussions among their coworkers and could engage them more than if the game was played alone. Cooperation is therefore identified to be a positive aspect when it comes to increasing the player's learning and engagement, but since it did not explicitly impact the game as a game element, it cannot be said to benefit *GDPR At Work* as much as imagined. However, this could be due to the single-player design of *GDPR At Work* and may still bring a bigger impact to other serious games with a design more suited for collaboration.

Table 9.1 includes a summary of all game elements that could be included in the game design of a serious game that aims to support staff training in IT companies.

Type	Game element	Description
Learning	Realistic scenarios	Enables reflection to a real life situation so that the player may be able to use the knowledge in their daily work practices. Players are also more interested to learn about practical application rather than abstract theory.
	Traditional knowledge transfer	Facilitates traditional learning. While remarked to not be too engaging, it is recognized as a necessary element to have in a game that supports staff training.
	Knowledge map	Helps the player to gain an overview of learned material at the same time give them recognition when seeing the summarized topic so they may memorize the content better.
	Quiz	Tests the player on the learned knowledge to help them remember better.
	Collaboration	Facilitate discussion among the players which can lead to improved learning.
Engagement	Time-based quiz	Brings the feeling of challenge to the player. Invoking emotions has been proved to be a good engagement method.
	Achievement	Bring the feeling of accomplishment to the player. Trophy-collecting is also a common motivation for players to complete a game.
	Dialogues	By presenting information in a more personal and fun way, the player will be able to relate better to the game characters and immense themselves into the game.
	Exploration	Exploring new areas can increase the player's engagement in the game in between the training sessions.
	Collaboration	Facilitates discussions among peers and give the player the feeling of belonging. Knowing that they're not alone in the training may provide motivation to see it to completion.

Table 9.1: List of recommended game elements

Chapter 10

Conclusion

This study contributes to understanding how serious games can support corporate training, specifically in mandatory GDPR training. This thesis contributed to the area of serious games applications at the workplace through: the literature review of existing serious games used in organizations (Chapter 3), the game design (Chapter 4), implementation (Chapter 6), and the evaluation and results of a serious game that can be used to support GDPR training at companies called *GDPR At Work* (Chapter 5, 7, 8).

Previous research has revealed a gap in the literature regarding the use of serious games in corporate training, especially on the topic of GDPR, which is mandatory for many companies today after the regulation came into effect. Therefore, this research focuses on minimizing the gap by identifying game elements that can be used to develop such games and investigate their effects through evaluations with potential users. A conceptual prototype was developed to explore the possibility of using serious games as an alternative to existing GDPR training.

10.1 Research Questions

This section strive to answer the research questions that laid out the foundation for this research.

> **RQ1:** How can serious games be used in GDPR training of employees at IT companies?

The main contribution of the thesis consisted of the design, implementation and evaluation of the serious game *GDPR At Work*. This game is an office simulation game that can be used to support the education of employees on the topic of GDPR through the use of various learning approaches. The answer to the main research question relies on the findings of the sub-research questions, and comprises of the knowledge attained throughout the

process of developing the game concept described in this thesis.

Chapter 3 resulted in a list of possible methods for integration of a serious game in companies, as well as different learning approaches that can be used in the design of a serious game for corporate training. These findings were considered and a game concept was created and implemented in the form of *GDPR At Work*, and was evaluated in this research. The game was created as an alternative to existing mandatory GDPR training, which is considered as boring and uninteresting to most employees, and does not provide high learning outcome. The results of the final evaluation with the target group suggested that the game concept proposed in this thesis is well-suited as an alternative to existing GDPR training. Table 9.1 provides a list of recommended game elements in creating a game to support mandatory GDPR training.

> **RQ1.1:** How can a serious game for GDPR training of employees be integrated into IT companies?

In chapter 3, an investigation of existing serious games used in corporate training was conducted. The results suggested that when designing a serious game to be used in companies, it was important to consider how the company may able to customize the game content, as each company may operate in a different way. This finding led to several major design decisions of *GDPR At Work*. The game proposed to include different roles, trainers and learners, as a way to integrate the game into companies. The participants in the final evaluation also agreed that rather than producing a complete package, it was better to produce a flexible product that can be used in different companies. Furthermore, the trainer role can directly provide support to the learners in different ways that can benefit their learning through the game. Trainers must also ensure that all learners have completed the mandatory training, so the game may offer a trainer dashboard in order to help them monitor the training progress of the learners.

The literature review revealed that computer- or web-based training is mostly used in corporate training, as it can be played independently by employees across the organization with low equipment cost. However, training can be done both independently and collaboratively. The game concept was evaluated with users from the target group, and the results suggested that independent training would be preferred. However, collaborative training would also be welcomed as it can have positive effects on the relationship with their coworkers. This type of training would require additional effort as it needs to be organized and set up in a specific context. *GDPR At Work* suggests to have a trainer assume the responsibility of organizing and setting up such a training session. Based on previous findings, the employees responsible for GDPR training would not mind assuming such a role, as this type of training method is used in existing training as a way to tailor the training content toward specific roles.

> **RQ1.2:** How can engagement and learning elements be used in a serious game to support mandatory GDPR training?

GDPR is not a topic that most employees consider interesting, hence there is a need to use engaging elements to motivate the employees under GDPR training. *GDPR At Work* accomplished this by using various game elements. The target group felt mostly motivated by visible rewards that can be collected after completing a task, such as achievements. Visually appealing game graphics also resulted in the desire to explore various parts of the game, thus increasing the engagement and helped to keep the interest of players inside the game. The most engaging element in the game proved to be the interactive dialogues with NPCs inside the game. According to the players, the personal dialogues and made it easy for them to relate to the character, and this form of communication was memorable and engaging.

The results of the literature review also identified several learning approaches used in serious games for corporate training. It was revealed that learning through reflection was the best learning method that could result in high learning outcome. Specifically, reflection through the use of realistic game scenarios was found to be able to enhance the decision-making skills of players, as well as potentially assist them in their daily work practices. The users from the target group also expressed similar sentiment.

The presentation of the learning content proved to be crucial to the learning outcome as well. While it was important to include relevant learning outcome, it was also extremely critical to explain the information in a clear and understandable way and present it in a way that is engaging for the players. The realistic scenario presented in the game through the use of engaging dialogues with NPCs that the player can relate to was received positively by the target group. On the other hand, the same information presented through a text-based format did not receive the same enthusiastic feedback. It was by incorporating engaging game elements in the presentation of the information that led to positive feedback from the players.

10.2 Strengths and Limitations

The strength of the results in this thesis is supported by data collected from various data collection tools. The game concept was developed through three iterations based on evaluations with game experts and target group users. In the first evaluation of the game concept, the focus was to generate qualitative data which was used to improve the game design in relation to learning and engagement aspects. The first version of the the game implementation was then evaluated with a game expert, to ensure that the concept was up-to-standard and ready to be evaluated with the target group users. The main evaluation consisted of assessment with several users from the target group that worked to gain insight into how the game worked to increase the engagement and learning in GDPR training. All of the evaluations were conducted through qualitative interviews. The results of the thesis is validated by data collected through qualitative sources with several highly relevant users.

One limitation of the research was the few numbers of trainer candidates that participated in the main evaluation. To fulfill a trainer role, an employee must satisfy specific requirements: they must have experience with creating GDPR training. It is a challenging task to

discover potential trainer candidates, especially without the use of networking or through attending events and conferences. Several attempts have been made to contact other potential trainer candidates but they yielded no results in the end. Similarly, it was also slightly challenging to find learner candidates that have already went through GDPR training.

Another limitation laid on the game implementation that focused on creating a conceptual prototype. It is difficult to say for certain whether the players would truly achieve higher learning outcome, as the prototype was not a complete product. However, GDPR training is a complicated topic, and it is not possible to create a prototype that can support a complete learning content due to limited resources. No usability test was done in the development of this prototype, however, the main evaluation suggested that the game had a generally high level of usability. Some of the users that evaluated the game had a background in design, and they had good impressions of the usability in the game.

10.2.1 Data Collection Methods

Group Interview

A group interview was conducted as a method to evaluate the game concept prior to implementation. The interview was conducted through a Zoom meeting, and it was difficult to see who was speaking. However, as no cameras were involved, it was possible that the participants felt more comfortable and managed to speak their mind in a free manner. Some of the participants were more vocal about their opinions than others, but the participants were generally polite, asking others to speak first and finish their thoughts before asking to speak themselves. Only notes were taken during the interview process, and some of the group interview results documented in this report relied on the memory of the researchers alone. While this could have been unreliable after some time has passed, most of the documentation of the results was done shortly after the group interview was conducted.

Individual interviews

In the interview with the game expert, they often interrupted the explanation of the game to inquire about specific topics and gave their opinions freely. As the interview done through a video conferencing tool, it was difficult to understand what the participant was saying at times due to unstable internet. Therefore, some of the information could have been missed. The researchers therefore attempted to summarize their feedback at the end of the interview to confirm that all of their opinions have been noted down.

The interviews were held immediate after the participants have finished playing the game in the main evaluation. This was done to ensure that their impression and opinion about the game remain fresh in order to ensure the quality of the feedback. Some of the interview respondents have previously participated in previous evaluation, and the researchers have therefore a connection to them to some degrees. Based on this, there was a slight possibility that some of them were withholding negative feedback. The participants were encouraged to speak freely in order to prevent this from happening. As another method to validate the positive feedback, notes of the participants' reaction during the game play

was carefully taken. Most seemed enthusiastic and engaged as laughter and short praises were often expressed as they progressed through the game.

10.3 Future Work

There are many things to consider when it comes to the future work concerning this research. One aspect to consider is the usability of the developed game. Received feedback indicates that while *GDPR At Work* is an easy game to understand when it comes to navigation, a few evaluation participants still slightly struggled with understanding where to interact in the game at the start. Further research should be therefore done in order to ensure the smoothest start for a new player to the game. The possibility of making a *tutorial* is encouraged as well, as this is a common element to add in many existing games.

The term "level" used to described the different parts of learning content created misunderstanding, as some players thought the training content varied in difficulty. The term "level" should have been exchanged for another term, such as "part", to indicate that the content consists of different parts of GDPR. Further research should therefore consider pedagogic aspects as well to avoid such misconceptions.

Another aspect to consider in future work is the possibility of incorporating collaboration as a game element. While *GDPR At Work* did include this game element in the conference room, it did not gain much attention from the target users. Further research should therefore be done following this idea in order to find a better way to integrate this element into the serious game. The evaluations has proven that some of the players would be open to the aspect of cooperating with other players while playing the game, which could be an inspiration to this research as well.

Chapter 8 revealed that exploration was a game element that got very positive feedback when it comes to increasing the player's engagement of the game. This aspect of *GDPR At Work* should therefore be explored where new locations could be added to the game together with new training levels. Research could be done on different locations that could bring the player engagement while at the same time contributes to the player's learning and/or reflection. An important aspect to consider is that the location should be realistic such that it can more easily be related to by the player.

Finally, more research is suggested to be done on more varied methods of learning. Currently, the training room relies on the traditional knowledge sharing to teach the players the important content of the GDPR. More research could be done on other game elements that could make this traditional knowledge transfer more engaging. One such method was done to the realistic scenarios where the case text was portrayed differently by Ada in the lunch room. This created motivation for the player to continue the game while still enabled them to learn. As the training room is one of the most important learning components of *GDPR At Work*, it is imperative that the learning method is transformed so that it will be engaging to the player. This would be an important contribution in a serious game that aims to support staff training.

Bibliography

ABET (2006). ABET Annual Impact Report. Internet: https://www.abet.org/about-abet/publications/.

Aladawy, D., Beckers, K., and Pape, S. (2018). Persuaded: Fighting social engineering attacks with a serious game. In *International Conference on Trust and Privacy in Digital Business*, pages 103–118. Springer.

Anderson, E. F., McLoughlin, L., Liarokapis, F., Peters, C., Petridis, P., and De Freitas, S. (2010). Developing serious games for cultural heritage: a state-of-the-art review. *Virtual reality*, 14(4):255–275.

Angehrn, A. A. and Maxwell, K. (2009). Eagle racing: Addressing corporate collaboration challenges through an online simulation game. *Innovate: Journal of Online Education*, 5(6).

Bachvarova, Y., Bocconi, S., van der Pols, B., Popescu, M., and Roceanu, I. (2012). Measuring the effectiveness of learning with serious games in corporate training. *Procedia Computer Science*, 15:221–232.

Barn, T. (2020). Team-Up. Internet: http://thebarngames.nl/teamup/.

Beckers, K. and Pape, S. (2016). A serious game for eliciting social engineering security requirements. In *2016 IEEE 24th International Requirements Engineering Conference (RE)*, pages 16–25. IEEE.

Beckers, K., Pape, S., and Fries, V. (2016). Hatch: hack and trick capricious humans–a serious game on social engineering. In *Proceedings of the 30th International BCS Human Computer Interaction Conference 30*, pages 1–3.

Berger, E. and Sæthre, T. H. (2018). PrivaCity: A Chatbot Serious Game to Raise the Privacy Awareness of Teenagers. Master thesis in TDT4900, Department of Computer Science, NTNU – Norwegian University of Science and Technology.

Blair, L., Bowers, C., Cannon-Bowers, J., and Gonzalez-Holland, E. (2016). Understanding the role of achievements in game-based learning. *International Journal of Serious Games*, 3.

Boller, S. (2013). Using game mechanics and game elements in learning games.

Boud, D. K. and Keogh, R. (1985). R. & walker, d.(1985). promoting reflection in learning: A model. *Reflection: Turning experience into learning*, pages 18–40.

Burnard, P., Gill, P., Stewart, K., Treasure, E., and Chadwick, B. (2008). Analysing and presenting qualitative data. *British dental journal*, 204(8):429.

Calder, A. (2016). *EU GDPR A Pocket Guide second edition*. IT Governance Ltd.

Chassang, G. (2017). The impact of the eu general data protection regulation on scientific research. *ecancermedicalscience*, 11.

Cone, B. D., Thompson, M. F., Irvine, C. E., and Nguyen, T. D. (2006). Cyber security training and awareness through game play. In *IFIP International Information Security Conference*, pages 431–436. Springer.

Czikszentmihalyi, M. (1990). Flow: The psychology of optimal experience.

Darban, M. and Polites, G. L. (2016). Do emotions matter in technology training? exploring their effects on individual perceptions and willingness to learn. *Computers in Human Behavior*, 62:644 – 657.

Deci, E. L. and Ryan, R. M. (1985). Conceptualizations of intrinsic motivation and self-determination. In *Intrinsic motivation and self-determination in human behavior*, pages 11–40. Springer.

Dell (2016). GDPR: Perceptions and Readiness. A Global Survey of Data Privacy Professionals at companies with European Customers. http://www.eurocloud.fr/wp-content/uploads/2016/10/gdpr.pdf.

Donovan, L. and Lead, P. (2012). The use of serious games in the corporate sector. *A State of the Art Report. Learnovate Centre (December 2012)*.

Eller, C., Bittner, T., Dombois, M., and Rüppel, U. (2018). Collaborative immersive planning and training scenarios in vr. In *Workshop of the European Group for Intelligent Computing in Engineering*, pages 164–185. Springer.

Elm, D., Tondello, G. F., Kappen, D. L., Ganaba, M., Stocco, M., and Nacke, L. E. (2016). Clever: A trivia and strategy game for enterprise knowledge learning. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts*, CHI PLAY Companion '16, pages 61–66, New York, NY, USA. ACM.

Filipczuk, D., Mason, C., and Snow, S. (2019). Using a game to explore notions of responsibility for cyber security in organisations. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, CHI EA '19, pages LBW0267:1–LBW0267:6, New York, NY, USA. ACM.

Finke, I. and Will, M. (2003). Motivation for knowledge management. In *Knowledge Management*, pages 66–91. Springer.

Fontana, A., Frey, J. H., et al. (2000). The interview: From structured questions to negotiated text. *Handbook of qualitative research*, 2(6):645–672.

Gallagher, A. G., Ritter, E. M., Champion, H., Higgins, G., Fried, M. P., Moses, G., Smith, C. D., and Satava, R. M. (2005). Virtual reality simulation for the operating room: proficiency-based training as a paradigm shift in surgical skills training. *Annals of surgery*, 241(2):364.

García, O., Fernández, D., Membrives, J., and Ris, A. (2018). Welcome aboard: Applying motivational design to a corporate onboarding project. *Proceedings of the European Conference on Games Based Learning*, pages 126 – 135.

Goeke, L., Quintanar, A., Beckers, K., and Pape, S. (2019). Protect–an easy configurable serious game to train employees against social engineering attacks. In *Computer Security*, pages 156–171. Springer.

Gouveia, D., Lopes, D., and De Carvalho, C. V. (2011). Serious gaming for experiential learning. In *2011 Frontiers in Education Conference (FIE)*, pages T2G–1. IEEE.

Gruschka, N., Mavroeidis, V., Vishi, K., and Jensen, M. (2018). Privacy issues and data protection in big data: A case study analysis under gdpr. In *2018 IEEE International Conference on Big Data (Big Data)*, pages 5027–5033.

Guillén-Nieto, V. and Aleson-Carbonell, M. (2012). Serious games and learning effectiveness: The case of it'sa deal! *Computers & Education*, 58(1):435–448.

Hall, T. (2017). When to Do an Expert Evaluation, and How to Make It Stick. https://uxplanet.org/when-to-do-an-expert-evaluation-and-how-to-make-it-stick-8e53fc34682f .

Henriksen-Bulmer, J., Faily, S., and Jeary, S. (2019). *Implementing GDPR in the Charity Sector: A Case Study*, pages 173–188. Springer International Publishing, Cham.

Hevner, A., R, A., March, S., T, S., Park, Park, J., Ram, and Sudha (2004). Design science in information systems research. *Management Information Systems Quarterly*, 28:75–.

IBM (2011). The INNOV8 BPM Simulation Game.

Irvine, C. E. and Thompson, M. F. (2004). Expressing an information security policy within a security simulation game. Technical report, NAVAL POSTGRADUATE SCHOOL MONTEREY CA.

Jih, H. J. and Reeves, T. C. (1992). Mental models: A research focus for interactive learning systems. *Educational Technology Research and Development*, 40(3):39–53.

Kirkpatrick, D. and Kirkpatrick, J. (2006). *Evaluating training programs: The four levels*. Berrett-Koehler Publishers.

Kolb, D. A. (1984). The process of experiential learning. experiential learning: experience as the source of learning and development. In *:*, pages 20–38. Prentice-Hall, Inc.

Krogstie, B. R. (2009). A model of retrospective reflection in project based learning utilizing historical data in collaborative tools. In *European Conference on Technology Enhanced Learning*, pages 418–432. Springer.

Krueger, R. A. (2014). *Focus groups: A practical guide for applied research*. Sage publications.

LEGO (2020). LEGO Serious Play. Internet: https://www.lego.com/en-us/seriousplay.

Lin, H. and Sun, C.-T. (2015). *Massively Multiplayer Online Role Playing Games (MMORPGs)*.

Macaulay, T. (2019). The biggest ICO fines for data protection breaches and GDPR contraventions. https://www.computerworld.com/article/3412284/the-biggest-ico-fines-for-data-protection-breaches-and-gdpr-contraven
html.

Malone, T. W. (1980). What makes things fun to learn? heuristics for designing instructional computer games. In *Proceedings of the 3rd ACM SIGSMALL Symposium and the First SIGPC Symposium on Small Systems*, SIGSMALL '80, pages 162–169, New York, NY, USA. ACM.

Michael, D. R. and Chen, S. L. (2005). *Serious games: Games that educate, train, and inform*. Muska & Lipman/Premier-Trade.

Olanrewaju, A.-S. T. and Zakaria, N. H. (2015). Social engineering awareness game (SEAG): an empirical evaluation of using game towards improving information security awareness.

Pannese, L. and Morosini, D. (2011). Serious games for reflective learning. In *International Conference The Future of Education*.

Pannese, L. and Morosini, D. (2014). Serious games to support reflection in the healthcare sector. *Int. J. Serious Games*, 1(3):5–14.

Pannese, L., Prilla, M., Ascolese, A., and Morosini, D. (2013). Serious games for reflective learning: Experiences from the mirror project. In *Cases on Digital Game-Based Learning: Methods, Models, and Strategies*, pages 452–474. IGI Global.

Perrotta, C. (2013). Game-based learning: latest evidence and future directions.

Perryer, C., Celestine, N., Scott-Ladd, B., and Leighton, C. (2016). Enhancing workplace motivation through gamification: Transferrable lessons from pedagogy. *The International Journal of Management Education*, 14:327–335.

Petersen, S. A. and Ekambaram, A. (2016). Interaction, experience, reflection: Enhancing project management training using serious games. In *European Conference on Games Based Learning*, page 521. Academic Conferences International Limited.

Petersen, S. A. and Oliveira, M. (2017). Reflection continuum model for supporting reflection and game-based learning at the workplace. In Alcañiz, M., Göbel, S., Ma, M., Fradinho Oliveira, M., Baalsrud Hauge, J., and Marsh, T., editors, *Serious Games*, pages 224–234, Cham. Springer International Publishing.

Phan, T. A. N. and Phan, Q. A. N. (2019). Game as a tool to assist IT companies in GDPR staff training programme. Project report in TDT4501, Department of Computer Science, NTNU – Norwegian University of Science and Technology.

Reeve, J., Ryan, R., Deci, E. L., and Jang, H. (2008). Understanding and promoting autonomous self-regulation: A self-determination theory perspective. *Motivation and self-regulated learning: Theory, research, and applications*, pages 223–244.

Riedel, J. and Azadegan, A. (2014). A framework for serious games use in companies. In *European Conference on Games Based Learning*, volume 2, page 487. Academic Conferences International Limited.

Riedel, J. C., Feng, Y., and Azadegan, A. (2013). Serious games adoption in organizations–an exploratory analysis. In *European Conference on Technology Enhanced Learning*, pages 508–513. Springer.

Riedel, J. C., Feng, Y., Azadegan, A., Romero, M., Usart, M., and Hauge, J. B. (2014). Measuring the commercial outcomes of serious games in companies–a review. In *International conference on serious games development and applications*, pages 176–191. Springer.

Riedel, J. C., Feng, Y., Hauge, J. M. B., Hansen, P. K., and Tasuya, S. (2015). The adoption and application of serious games in corporate training—the case of manufacturing. In *2015 IEEE International Conference on Engineering, Technology and Innovation/International Technology Management Conference (ICE/ITMC)*, pages 1–9. IEEE.

Rosmansyah, Y. et al. (2016). Gamification framework for designing online training and collaborative working system in statistics indonesia. In *2016 International Conference on Information Technology Systems and Innovation (ICITSI)*, pages 1–6. IEEE.

Rubin, H. J. and Rubin, I. S. (2011). *Qualitative interviewing: The art of hearing data*. Sage.

Ryan, R. M. and Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1):54 – 67.

Sammut, R., Seychell, D., and Attard, N. (2014). Gamification of project management within a corporate environment: An exploratory study. In *2014 6th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES)*, pages 1–2. IEEE.

Saxegaard, E. (2019). CITY: An Informative Serious Game to Raise Girls' Awareness of IT. Master thesis in TDT4900, Department of Computer Science, NTNU – Norwegian University of Science and Technology.

Schaab, P., Beckers, K., and Pape, S. (2016). A systematic gap analysis of social engineering defence mechanisms considering social psychology. In *HAISA*, pages 241–251.

Schardt, C., Adams, M., Owens, T., Keitz, S., and Fontelo, P. (2007). Utilization of the pico framework of improve searching pubmed for clinical question. *BMC medical informatics and decision making*, 7:16.

Schön, D. (1938). The reflective practitioner. *New York*, 1083.

Senderek, R., Brenken, B., and Stich, V. (2015). The implementation of game based learning as part of the corporate competence development. In *2015 International Conference on Interactive Collaborative and Blended Learning (ICBL)*, pages 44–51. IEEE.

Shostack, A. (2014). *Threat modeling: Designing for security*. John Wiley & Sons.

Sweetser, P. and Wiles, J. (2005). Scripting versus emergence: Issues for game developers and players in game environment design. 4.

Tang, S., Hanneghan, M., and El Rhalibi, A. (2009). Introduction to games-based learning. *Games-Based Learning Advancements for Multi-Sensory Human Computer Interfaces: Techniques and Effective Practices*, pages 1–17.

Team, I. P. (2017). *EU general data protection regulation (GDPR): an implementation and compliance guide*. IT Governance Ltd.

The Norwegian Data Protection Authority (2017). Software development with Data Protection by Design and by Default. https://www.datatilsynet.no/en/about-privacy/virksomhetenes-plikter/innebygd-personvern/data-protection-by-design-and-by-default/.

Thiebes, S., Lins, S., and Basten, D. (2014). Gamifying information systems-a synthesis of gamification mechanics and dynamics.

UX, A. A. (2010). Methods for Expert Evaluation. https://www.allaboutux.org/expert-methods.

Williams, L., Meneely, A., and Shipley, G. (2010). Protection poker: The new software security" game". *IEEE Security & Privacy*, 8(3):14–20.

Wouters, P., Van Nimwegen, C., Van Oostendorp, H., and Van Der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of educational psychology*, 105(2):249.

Zinke, C., Friedrich, J., and Haefner, A. (2018). Motivation for corporate training through feedback in social serious games. In *2018 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, pages 1–9. IEEE.

Appendix A

Final Game Description

The game consist of 5 different scenes—the reception, the training room, Ada's office, the lunch room, the virtual phone—all of which accessible through navigating within the phone scene. The game does not have a real ending as more training levels can be added. For this version of the game, the game will end after 3 levels.

The game mechanics incorporated into this game were chosen based on the results of the state of the art findings from both the specialization project and the findings found in chapter 3, in addition to the findings and feedback based on the previously performed interviews and evaluations.

A.1 Reception Scene

Scene Description

The reception initially serves as an introduction to the player. There is a receptionist NPC who offers the player different hint dialogues based on the player's progression of the game. On first encounter, interacting with this receptionist prompts the player to choose a role between a learner or a trainer. After choosing a role, the player completes the game's first objective and continues on to the next.

Learning Goal

The reception does not offer much in the ways of learning goal, but more so as a point of reference the player can approach if they do not know what their next objective is.

Engagement Elements

The use of NPCs to increase player immersion into the game was described by Lin and Sun (2015). The receptionist as an NPC adds life to the office world which can make the

Figure A.1: The receptionist has different dialogues to guide the player

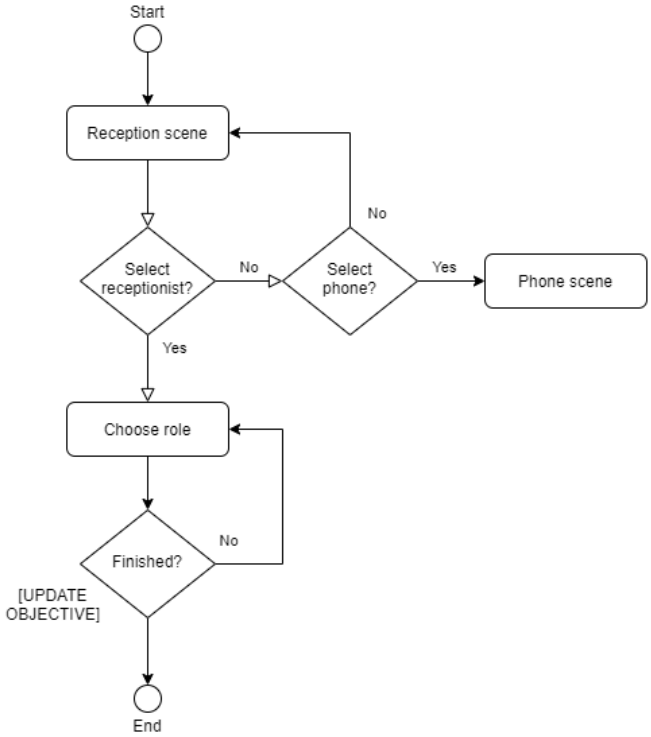


Figure A.2: Gameflow in the reception scene

player relate to the game better.

A.2 Training Room Scene

Scene Description

This scene is where one of the main learning methods takes place. The player gains access to this scene after completing the first objective of choosing a role. Upon prompt to start training, the player can choose a test level in the knowledge map. The levels are available incrementally in that the next level will only be available after completing the previous level. However, the player has the freedom to visit past levels if they wish to freshen up their knowledge.

After choosing a level, the player will go through a series of text and video descriptions of relevant. This is the traditional knowledge transfer, where the player is expected to memorize the information given on screen. After going through this step, a quiz will come at the end and the player must get all answers correct before they can proceed to the next level. Completing at least one training level is the game's second objective.

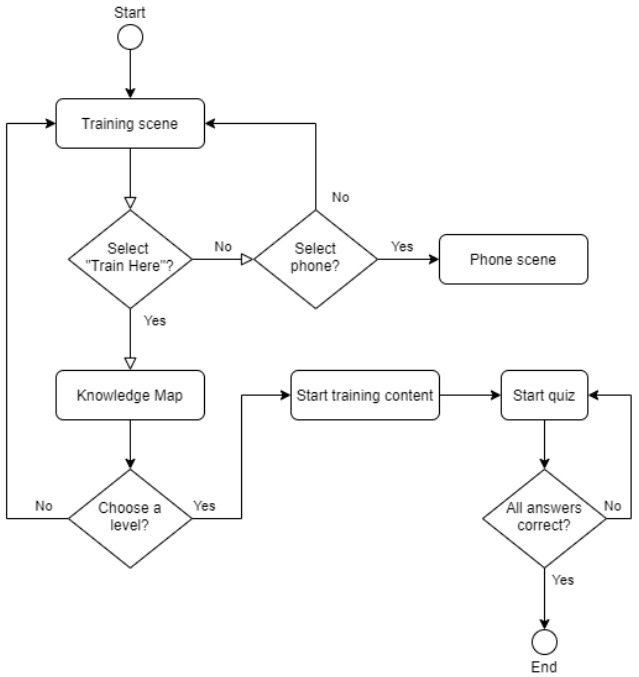


Figure A.3: Gameflow in the training room scene

Learning Goal

This section encompasses the learner learning goals described in table 4.1, which contains goals related to different elements in the GDPR.

Learning Elements

The main learning element used in this scenario is the traditional knowledge transfer in the first part of the training. Another element used was the knowledge map. This map contains a short list of the training topic on each level which can help the player gain an overview. An evaluation participant described that if she looks back at learned topics, she can get flashbacks of them. This can contribute to better learning as the player can be reminded of the topics they've learned.

Engagement Elements

The quiz presented at the end of the training facilitates engagement in the players. The emphasis on the variety of the quiz makes it not be so monotone and tiring to go through. The timer element can add a layer of stress to the player as well and invoke the feeling of challenge, which has been described by Darban and Polites (2016) as a good way to increase motivation.

A.3 Lunch Room Scene

Scene Description

This scene contains another NPC named Ada, who is an important character for the game's third and final objective: help Ada with a case. Upon interacting with Ada, the player is presented with friendly dialogue about Ada's job. She then asks the player for help on a GDPR-related case. At the end of this conversation, she asks the player reflective questions about the case she just presented to the player. Each choice will present the player with different feedback based on how correct the answer the player chose was. During some checkpoints of the conversation, the player has the choice to leave to take a break or explore other areas if they wish.

Learning Goal

This scene makes use of realistic scenarios to teach the player about GDPR application in the real world. It encourages reflection on different GDPR topic and seeks to engage the player in the topic better while still offering explanations and learning materials of the GDPR.

Learning Elements

The usage of realistic scenarios is the main learning element used in this scene. The friendly atmosphere surrounding Ada (a colleague) helps the player to feel less intimidated

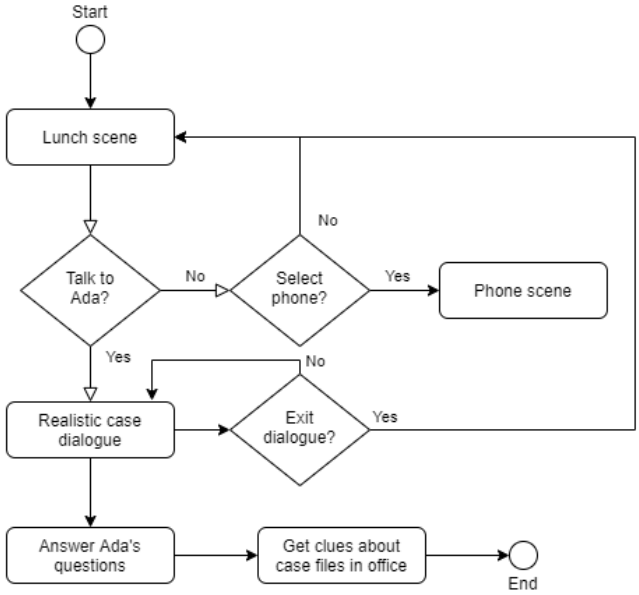


Figure A.4: Gameflow in the lunch room scene

by the huge amount of text she is producing, and the player can digest the information better due to each dialogue limiting the amount of text on screen.

Engagement Elements

Dialogue is an important engagement element used in this scene. The dialogues are designed to be friendly so that the player can relate to the character better and thus increase engagement in the game. This also draws back to the aim of using NPCS to immerse the player into the game and its world. The design of the lunch room also feel very open and casual which seeks to add to the friendly atmosphere. An evaluation from a trainer in chapter 8 also described that the situation of having lunch together and chatting about work problems also seem very realistic, and makes them feel more engaged due to the familiarity of the game.

A.4 Phone Scene

Scene Description

The phone scene is accessible on the bottom right of the game in most situations of the game. This phone serves several purposes, some of which include guiding the player to the next objective, navigation around the office buildings and enable the player to check their achievements or training status. Each functionality has its own app that the player

can select to see more about it. If there is a new objective or the player has received a new achievement, the phone will blink with a red dot every half a second to notify the player that there is something new in the phone.

Figure A.5: Home of the phone screen

Selecting each application opens up its own interface, which can either display the next objective, the different areas in the office world, the achieved achievements or the training level statistics.

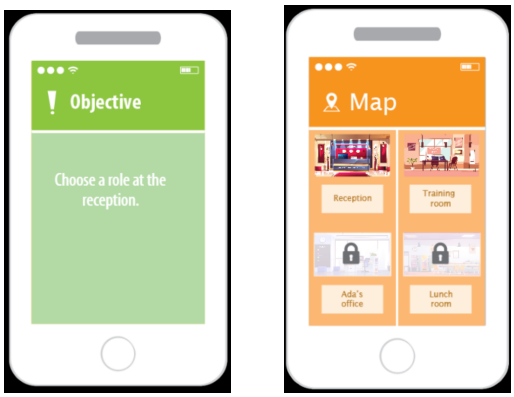


Figure A.6: Interfaces of objective and map

As can be seen in figure A.6, the map has certain rooms locked until further instruction. This is connected to the objectives: the player can only unlock new rooms after they complete certain objectives of the game.

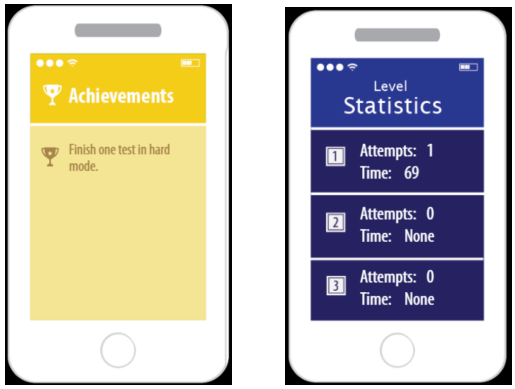


Figure A.7: Interfaces of achievements and statistics

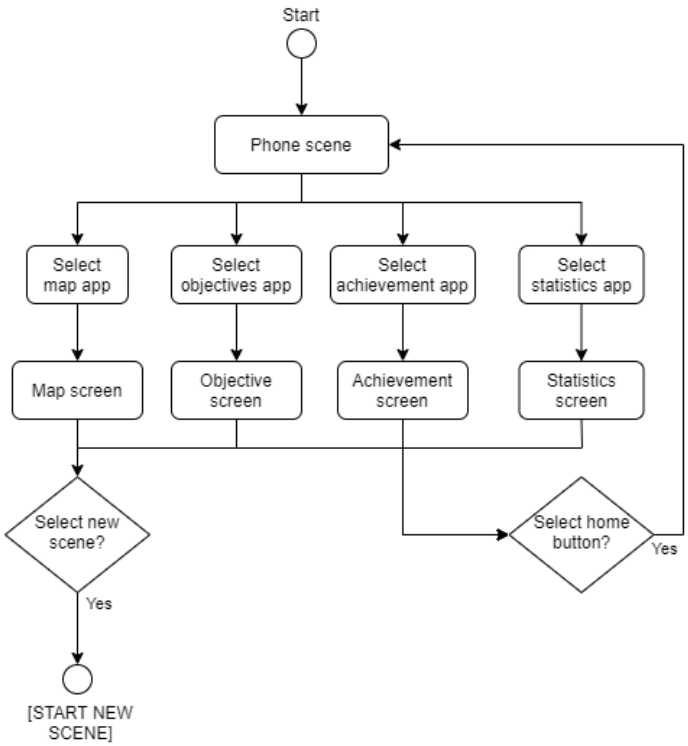


Figure A.8: Gameflow in the phone scene

A.4.1 Learning Goal

This scene, similarly to the reception, does not focus on giving the player learning content. It focuses more on the engagement aspect of the game which is described below.

A.4.2 Engagement Elements

There are many engagement elements incorporated in this virtual phone scene. One is invoking the player's curiosity through unlocking rooms in the map. By showing the player that there are still rooms to explore, they will feel more compelled to complete the current objectives in order to gain access to new areas. This element adds more depth to the element map exploration, another game element which was identified to be a very good engagement-increasing game mechanic.

Another engagement-increasing game mechanic included in the map scene is achievement. Achievement was identified in previous state of the art research to be a good addition to have to increase player engagement in the game. During gameplay, different achievements will be attained through different actions, and the player will be encouraged to collect them all.

The statistics screen shows the player their training status, with descriptions of how many times they have performed on each level and their best high score calculated by their best time. By seeing these statistics, the player may feel more encouraged to go through the training again to improve their score.

Appendix B

Group Interview

B.1 Interview Guide

Related to game concept

1. What do you think about the current concept?
2. What do you think about the current rewards for completing each level in training?
3. Is the phone sufficient in helping the player progress? There is no clearly defined "quest board", is that better than a phone?
4. If the manager was to add more content later, is the current "measurement of performance" enough?
5. Should we include other roles? For instance something like a GDPR expert that will answer questions related to GDPR?
6. Is the idea of a reception necessary? It's normal to have a reception at a company, but employees rarely use it unless they require help.
7. Regarding the conference room. The idea is to have a Kahoot-like experience. But should we just link to Kahoot? Or make something similar to Kahoot in the game?
8. Is the role of the meeting room clear enough? If not, can we implement this content in a different way?

Related to game play and elements

1. What do you think about the current game elements in the entire game? Is it engaging enough?
2. Is the game play to learn and reflect on the computer engaging enough?

3. Should we include more mini-game to test their knowledge? In the current knowledge test, should we include penalties for incorrect answers?
4. How should the player navigate through the game? Through a character sprite or click-based?

B.2 Slides

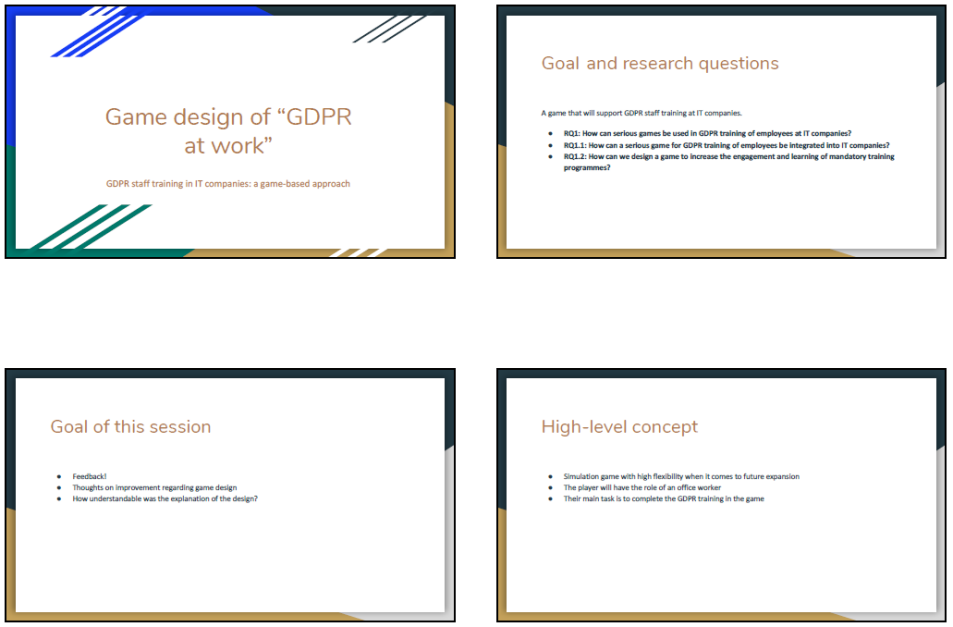
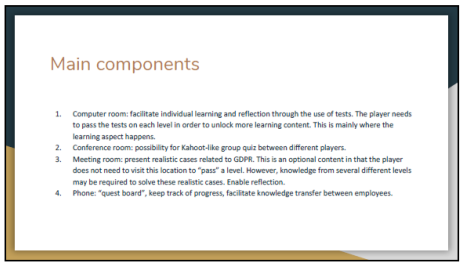
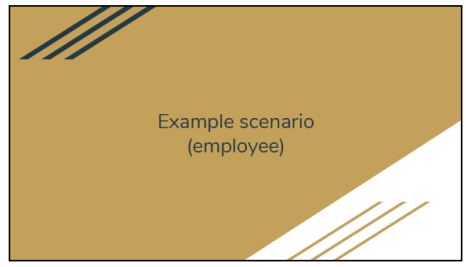
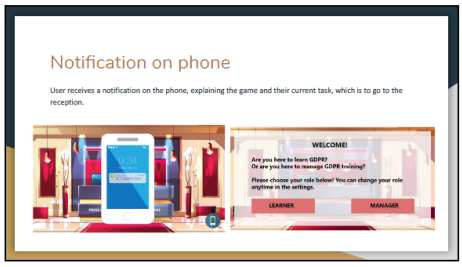


Figure B.1: Slides used for group presentation 1







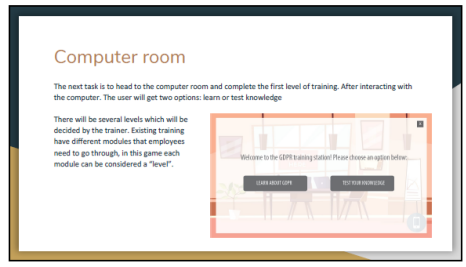
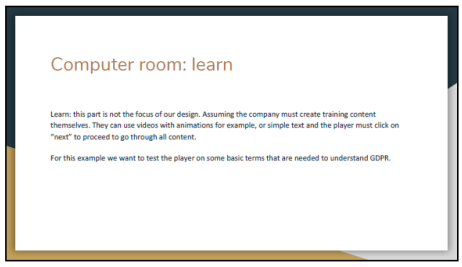
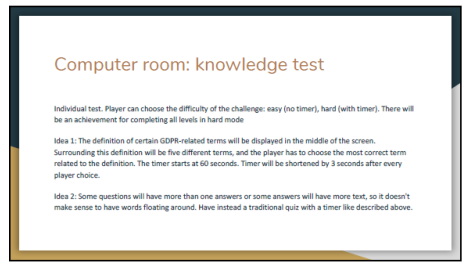


Figure B.2: Slides used for group presentation 2





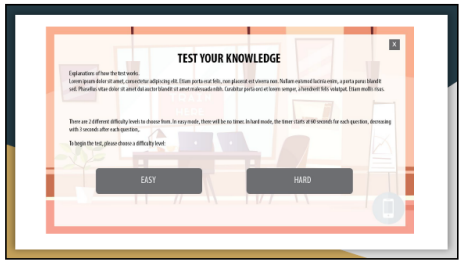
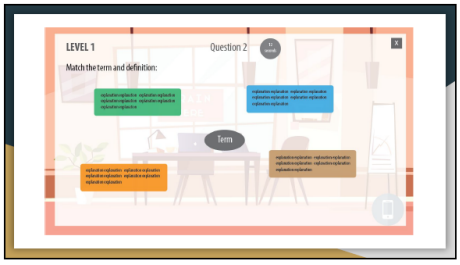
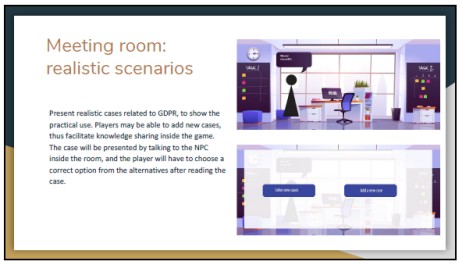


Figure B.3: Slides used for group presentation 3





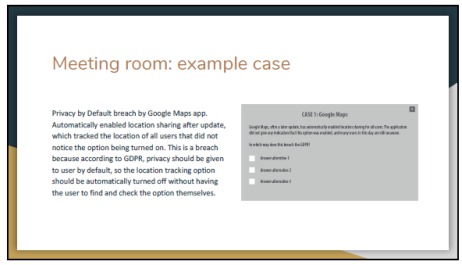
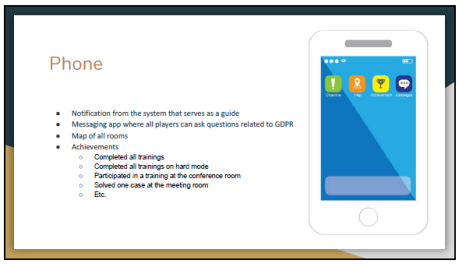
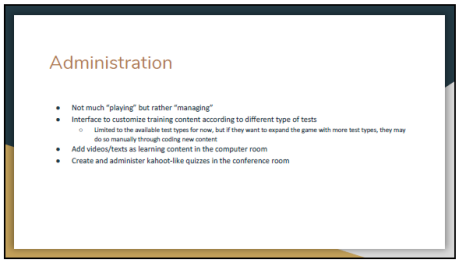


Figure B.4: Slides used for group presentation 4





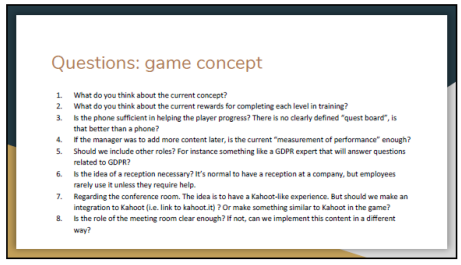


Figure B.5: Slides used for group presentation 5

Appendix C

Game Expert Evaluation

C.1 Interview Guide

Reception

1. Do you think the reception is a good guide for the player?
2. Do you think the NPC should be clickable?

Training room

1. Do you think it was difficult to see what was clickable?
2. What do you think about the knowledge map?
3. How do you think information should be presented in an interesting way?
4. How much information do you think should be presented in a time frame?
5. The current design allows the trainer to add in training content through the use of text, photos and videos. Do you think these are enough? Should we add in other media forms as well?
6. What do you think about the concept of a time-based quiz? Is it engaging enough?

Meeting room

1. What do you think about the way the case was presented? Did the titles on each page make sense?
2. What do you think about the quiz and feedback?
3. Do you think the questions in the quiz are reflective enough?

Phone

1. What do you think about the navigation in the game?
2. What do you think about the objectives? Do you think they are engaging enough?
3. What do you think about the achievements? Should all achievements be shown beforehand? Do you think they are engaging enough?

General

1. What do you think about the game concept?
2. What do you think about the different roles?

Appendix D

Main Evaluation

D.1 Interview Guides

D.1.1 Learner role

Integration

1. What do you think about having two roles as the way to integrate the game into the company?
2. How do you feel about the trainer having access to your game progress and able to see your results?
3. Would you like to get help from the trainer during the gameplay?
4. How do you think this game should be played? At home or at your company during work hours?

Engagement

1. Did you think it was difficult to play the game?
2. Did you think the game was interesting to play?
3. Do you think that it was more engaging or motivating to learn about how GDPR knowledge can be used in real life?
4. What was the most motivating element to you during gameplay?
5. What was the most engaging element to you during gameplay?

Learning

1. Did you think the information in the game was relevant for GDPR training?
2. What did you think about learning GDPR through the training room?
3. What did you think about the knowledge map?
4. What did you think about learning GDPR through realistic cases?
5. What did you think about the way the case was presented through Ada? How do you think a realistic case should be presented?
6. What do you think about learning GDPR collaboratively with others through using the game?
7. (If participant have undergone GDPR training) Do you think using this game is better to learn GDPR compared to the current training at your company?

General

1. What was your impression of the game?
2. What did you think about the game concept?
3. What did you think about the visual elements in the game? Did it affect your overall impression of the game?
4. Do you think this game is fit to be played at an IT company?
5. Do you think the game can be played by employees from all age groups?

D.1.2 Trainer role

Integration

1. What do you think about having two roles as the way to integrate the game into the company?
2. What do you think about the current method in adding training content and quiz?
3. What did you think about the way the case was presented through Ada? How do you think a realistic case should be presented?
4. Would you be willing to set up a case in such a setting?
5. What do you think about gathering employees to learn GDPR collaboratively through the conference room? Would you be willing to be responsible for setting up a training in such a setting?
6. Would you be interested in monitoring the training progress of each player? Or are you only interested in whether an employee has completed training or not?
7. How do you think this game should be played? At home or at your company during work hours?

General

1. What was your impression of the game?
2. What did you think about the game concept?
3. What did you think about the visual elements in the game? Did it affect your overall impression of the game?
4. Do you think this game is fit to be played at an IT company?
5. Do you think the game can be played by employees from all age groups?

GDPR Staff Training in IT Companies: A Game-Based Approach

NTNU
Norwegian University of
Science and Technology