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A serious game for teaching general practice management

Master thesis

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Abstract

The healthcare sector is a stakeholder-rich environment where many factors influence the quality of healthcare. Healthcare professionals are required to manage their organization at the same professional level as they perform their profession. The general practitioner (GP) domain is a prominent example that is before everybody's eyes. Multiple studies on the quality of GP educational programs in the Netherlands revealed that the majority of GPs in training and recently graduated GPs are dissatisfied with what they learn about running an own general practice. Their gained knowledge is mostly theory they study from textbooks as opposed to hands-on experience. The new-generation GPs are raised digitally and need novel learning methods that are better aligned with the modern society. We study the use of serious games to bridge this gap: serious games do not primarily focus on entertainment. In this thesis, we describe a serious game design called General Practice Manager that is aligned with teaching general practice management in the Dutch context. Our design is based on our proposed design framework that is built from a thorough study of the literature, document analyses and expert interviews. We developed a prototype of the game to demonstrate and evaluate the proposed design. The results obtained through focus group sessions and expert interviews indicate that our serious game design is a good start and has potential to bridge the educational gap, but also shows room for improving its realism and effectiveness.

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After working hard for almost a year, with some bumps on along the way, I can finally present my thesis to you. I have learned a lot during this period (of time). I have become aware of my personal strengths and weaknesses, as well as my limitations. I have gained some experience in conducting larger research projects. Before starting this thesis I did not know much about the GP and the serious game domain. This project has really opened my eyes and continues have my interest.

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1. Introduction

The healthcare sector is a stakeholder-rich environment where quality assurance questions, requirements and regulations are having an increasing influence on healthcare providers (NVZD, 2015). This increase in influence creates a growing pressure on these healthcare professionals and is causing the quality of healthcare organization management to become significantly important (Rijksoverheid, 2015a). Internal organizational challenges such as financial sustainability clash with external expectations (and regulations) on quality of service. These challenges are both visible in small and large healthcare organization at the same professional level as they perform their profession (Raad voor de Volksgezondheid en Zorg, 2013).

While large healthcare organizations have the possibility to provide their employees with extensive management and organization training, small healthcare organizations often cannot do so due to the relatively high investments that are required (Springest, 2015). Thus, it is important that healthcare professionals develop management skills during their educational program, so that they become aware of the policy choices that are required to be made to manage a healthcare organization. This gives them insight into the direct and indirect environment of a healthcare organization, increases their involvement and prepares them to perform management tasks (de Moor, 2013).

Until a few years ago the learn-by-doing protocol that most healthcare professionals experienced to deal with management issues while working. Managerial skills were not taught during educational program, because this subtracted room for the expertise training required for healthcare professionals to perform their jobs. This caused healthcare professionals to be unprepared when taking over, or starting a new or joining a healthcare organization (van der Velden, Hingstman, & Hofhuis, 2005). They would have no insight into the internal and external factors of an organization and how the organization should be managed. Therefore, many healthcare professionals attend training in management and organization at a later stage in their career (VvAA, 2009).

In the Netherlands, an increasing number of educational institutes for healthcare professionals have noticed the added value of management and organization training. With the Modernization Medical Vocational Training (*Modernisering Medische Vervolgopleidingen*, MVV) project, a new competencebased educational system has been launched, which requires every trainee healthcare professional to demonstrate their competences. Organization is one of the competence areas and depicts the healthcare professional as a manager. This area of competence requires healthcare professionals to demonstrate competences such as "working effective and efficient within a healthcare organization" and "using the available resources for patient care in a responsible way" (KNMG, 2009).

1.1 Problem statement

With the introduction of the competence-based educational system, many healthcare educational programs have improved their curriculum by adding courses on management and organization. However, the limitation of the current educational system is that healthcare professionals cannot experience different types of organizations and management styles, partly caused by the limited availability of internships. Most healthcare professionals only work for a few healthcare organizations during their career, thus do not gain much experience with different types of organizations and management styles. Furthermore, their knowledge is mostly from textbooks and is harder to apply in practice than hands-on experience. This lack of insight and experience prevents healthcare

professionals to effectively manage and improve their own medical practices, or are unable to help their employers improve theirs.

The general practitioner (GP) domain is a prominent example in which the majority of healthcare organizations are small, healthcare professionals only work for a few organizations and limited internships are available. A study on the quality of GP educational programs by van der Velden, Hingstman, & Hofhuis (2005) in the Netherlands revealed that the majority of GPs in training and recently graduated GPs are dissatisfied with the preparation of running an own general practice. The GPs that participated in the study exposed that they want to learn more about issues such as general practice management (GPM), entrepreneurship, leadership, IT, accounting and negotiating with healthcare insurance companies.

Some ago the Dutch GP educational program has implemented improvements by making GPM a mandatory part of the curriculum. Despite improvements, a study by van der Velden & Batenburg (2011) revealed that most of the GPs in training and alumni are still dissatisfied with most of the organizational competences, such as dealing with healthcare insurance companies and self-employment. The same conclusions are drawn in follow-up study (Heiligers, van der Velden, & Batenburg, 2014). Moreover, a survey by the association for car and doctor (*Vereniging voor Auto en Arts*, VvAA), a healthcare professional association revealed that over ninety per cent of the respondents, which are healthcare professionals including GPs believe that management in healthcare has not been addressed enough in their regular training programs. They specifically mention the lack of education, instruction and practical experience (VvAA, 2009).

Expert 1 (personal communication, April 16, 2015), a former GP trainer and general practice owner now working for the VvAA, mentions that GPs in training and recently graduated GPs should experience what it is like to run a general practice before starting or taking over a general practice. This experience should make them aware of the decisions that have to be made and allows them to make better decisions while managing and improving their own general practice. This is currently not the case in the educational programs, while there is an increasing demand for more efficient, engaging and cost-effective training programs in postgraduate healthcare training (Dankbaar, 2015). Furthermore, the new generation of students that entered education are raised with computers (digital natives) and have different learning preferences (Oblinger, 2004). Traditional learning methods do not fit this new generation, thus require new flexible, interactive and participative learning methods to be developed to improve the current situation (Prensky, 2007).

The limitations of traditional learning methods initiate new approaches that integrate real life components to let students experience real life situations, such as computer simulation and case studies (Arias-Aranda & Llorens-Montes, 2007). However, not much is known on the "optimal" design and effectiveness of these approaches (e.g. serious games) for healthcare professionals (Dankbaar, 2015). Using non-computer simulation as a tool to teach strategic management has proved to have potential to create competent business graduates that the industry demands. Simulation has the ability to transfer theory into practice, decision making in uncertain and realistic situations, apply multidisciplinary knowledge and managing team dynamics (Abdullah, Hanafiah, & Hashim, 2013).

Based on the previous paragraphs, we define the following problem statement: "GP students increasingly need to learn general practice management in an engaging manner that better suits the digital native generation."

1.2 Overview of our approach

An emerging approach to train healthcare professionals in organizational and management skills is training by serious gaming (Crookall, 2010). Serious games focus on developing educational or career related knowledge and skills, and are being used for educational and training purposes, thus is not primarily focused on entertainment (Michael & Chen, 2005). This approach could potentially be used to teach GPM and allow future general practice owners to experience what it is like to run a general practice by playing a serious game.

An example of a serious game that is considered successful is America's Army, which is a military simulation with combat missions and training exercises. The purpose of this serious game is to promote the American army and act as a recruitment tool for young people. According to Sawyer America's Army was: *"the first successful and well-executed serious game that gained total public awareness"* and had more than five million registered users (Gudmundsen, 2006). Moreover, a study by Bellotti, Kapralos, Lee, Moreno-Ger, & Berta (2013) has presented evidence from three studies that shows the potential of serious games for learning (note that America's Army is focused on advertising, and not so much on learning). In all three studies, students who had learned using games achieved higher test results than students who had learned via the traditional learning method. The concept and benefits of serious gaming is further elaborated on in Section 3.1.

Looking at literature there is a small quantity available on teaching and experiencing strategic management in business studies by using business simulation games with case studies (Abdullah et al., 2013; Arias-Aranda & Llorens-Montes, 2007). However, no literature is available on applying serious games to GPM in the Dutch context and this study aims to fill that gap. The serious game overlaps the education, management and primary care domain, which is shown in Figure 1.1. For this reason all three domains have been explored during this study.



Figure 1.1: Overlapping domains of this thesis

1.3 Relevance

The scientific and social relevance of this study is discussed in this section.

1.3.1 Scientific relevance

This subsection describes the scientific relevance of this study and the existing gaps we address, advancing the literature in the field. The overlap of the three domains mentioned earlier presents a state-of-the-art overview of the interrelation of these domains for the serious game. Moreover, an overview on related games for healthcare professionals and organizations is provided, describing the lessons learned. Furthermore, we analyze and compare the newly presented Dutch curriculum to international curricula, literature and an expert interviews. This provides an overview, which to our knowledge is not present in literature.

Finally, a scientifically grounded serious game design and framework is created for the serious game, which is implemented into an interactive prototype. This contributes to serious game design by employing a solid and well-defined method. Moreover, a serious game design that is aligned with teaching general practice management in the Dutch context. The obtained results through the evaluation determines if the serious game design for GPM is adequate, which is currently not present in literature and can be used to further exploration.

1.3.2 Social relevance

As described in the problem statement, it is important for GPs to experience what it is like to run a general practice before starting or taking one over. Playing the serious game should make them aware of the decisions that have to be made and should allow them to make better decisions while managing and improving their own general practice, thus teaches them about GPM.

While conducting this study, an overview of the intended learning outcomes for GPM has been created. This provides a useful overview for GP trainers as well as GP students. Creating a prototype and conducting a pilot with evaluation will determine how applicable it is to simulate general practice management using a serious game. Creating a prototype saves time and money, allows tailoring for the desired situation and reduce the number of unanticipated problems (Thabane et al., 2010). The serious game may also inspire professionals to apply the same concept to different learning environments and study the lessons learned in this the project.

1.4 Outline of the thesis

The rest of the thesis is structured as follows. Chapter 2 describes the research approach of this study that are used to answer the research questions. Chapter 3 provides an overview of the serious gaming concept, describes the assembled serious game design framework and presents an overview of related serious games. How the intended learning outcomes for the serious game have been derived is presented in Chapter 4. Chapter 5 describes the substantiated serious game design, which is based on the intended learning outcomes. The evaluation approach, the analysis and results of the evaluation are described in Chapter 6. Chapter 7 presents the conclusions and discussion of this thesis, which can provide opportunities for future work.

2. Research questions and approach

This chapter defines the research approach of this thesis. The first section contains the main research question and sub-questions. Furthermore, the research method is presented and discussed. Finally, the validity and reliability concerns are discussed.

2.1 Research questions

Based on the problem statement and motivation described in the previous chapter, the following research questions have been defined. The main research question is as follows:

RQ: "What can be learned from the design and development of a serious game for teaching general practice management in the Dutch context?"

The following sub-questions have been defined to answer the main research question:

SQ1: "What are serious games and what are methods for serious game design?"

To understand what serious games are and how they are designed, a literature study has been performed on the concept of serious games and design approaches such as frameworks. This has allowed us to determine the key elements of the serious game design process. These key elements have been assembled into a new framework that has been used for this study and has provided input for other sub-questions.

SQ2: "What lessons can be learned from existing related serious games?"

To learn more about existing related serious games that have been developed for healthcare professionals and organizations, design guidelines, experiences of players and lessons learned have been derived from literature. This has provided an overview of related games that has been used as inspiration and has determined the (anti)-requirements for the serious game.

SQ3: "What are the intended learning outcomes for teaching general practice management based on educational plans, literature and according to experts?"

Intended learning outcomes for GPM have been gathered to determine the purpose of the game. Firstly, learning outcomes have been derived conducting a document analysis on the curriculum, which are used in the GP educational program in the Netherlands. The same document analysis has been performed on GPM curricula of GP educational programs outside the Netherlands, which have been compared for cohesive intended learning outcomes.

Moreover, a literature study and expert interview has been conducted to further support and scope the findings from the curricula analysis. This has resulted into a list of intended learning outcomes for the serious game.

SQ4: "How to design and develop a serious game prototype for general practice management?"

While the previous questions mostly involve the current (AS-IS) situation, this question provides an answer for the desired (TO-BE) situation. To create a successful serious game, the intended learning outcomes (purpose) need to be encoded into the game, which has been conducted using our previously assembled framework. The serious game design describes the justified choices for the game such as game objectives and mechanics, which have been supported with literature and expert interviews.

Moreover, it describes how the game progresses, how players are engaged and envisions how the serious game will work while playing. This serious game design has been transferred into an interactive prototype, realizing the TO-BE situation.

SQ5: "How can our designed and developed serious game be evaluated against the learning outcomes for teaching general practice management?"

This sub-question describes how the intended learning outcomes, serious game design and prototype have been evaluated, using literature to determine the evaluation approach. It describes choices such as the evaluation methods that have been used and who participated and why. Finally, the results of the evaluation have been analyzed and described.

2.2 Research method

Due to the nature of this study the Design Science Research Methodology (DSRM) by Peffers, Tuunanen, Rothenberger, & Chatterjee (2007) has been used as a research method. The DSRM is used to conduct design science (DS) research in information systems (IS), is widely cited and meets three objectives. The first is being consistent with prior literature, followed by a nominal process model for DS research and finally a mental model for presenting and evaluating DS research in IS. DSRM consists of six steps, as shown in Figure 2.1 and is described in the following subsections.



Figure 2.1: DSRM process model (Peffers et al., 2007)

2.2.1 Identify problem and motivate

The problem statement defined in Section 1.1, states that GP students and alumni are dissatisfied with the focus on most of the organizational competences. In addition expert 1 (personal communication, April 16, 2015) mentions that GPs in training and recently graduated GPs should experience what it is like to run a general practice before starting or taking over a general practice, which is now not the case in the educational programs. Moreover, the new generation of students that entered education are raised with computers and have different learning preferences (Oblinger, 2004). Traditional learning methods do not suit new generation of students, which initiates a different approach (Prensky, 2007).

Finally, the previously described issues could potentially be solved by applying a serious game, which allows future general practice owners to experience what it is like to run a general practice, thus also teaches GPM. Serious games focus on developing educational or career related knowledge and skills and is not primarily focused on entertainment (Michael & Chen, 2005). There is currently no literature available on applying serious games to GPM in the Dutch context and this study aims to fill that gap.

2.2.2 Define objectives of solution

The main objective of this study is to design, create and evaluate a serious game that is aligned with teaching general practice management in the Dutch context. In addition several sub-objectives have been stated:

- Scientific contribution: In order to make a scientific contribution, it is essential to have a scientific foundation. This is also fundamental for a well-defined practical contribution, the serious game. The results of the study can be used for future research and inspiration to others.
- **Basis for GP education in the Netherlands:** The intended learning outcomes, design and prototype of the serious game should align with the GP domain in the Netherlands. GPs should be familiar with the intended learning outcomes and content used in the serious game. This should allow GP trainers and students to provide feedback to improve the serious game. The prototype will also serve as a base for developing future serious games in other learning environments.
- **Game should be contextualizable:** The game should be configurable to provide different contexts to players. Providing different contexts should allow players to learn from different situations.
- **Real data:** The use of real data to create realistic scenarios. Using real data should allow GPs to gain hands-on experience for running a general practice, while making complex decisions in a safe environment.

2.2.3 Design and development

To be able to develop the serious game, the current situation (AS-IS) has to be identified and the desired situation (TO-BE) has to be created. For the AS-IS situation, expert interviews, a literature and document analysis have been conducted. Firstly, the concept of serious gaming and its benefits have been described. Secondly, an overview has been provided on how serious games can be designed and a new serious game design framework for this study has been assembled. Thirdly, an overview on lessons learned on related serious games has been provided and is described in Chapter 3.

To determine the intended learning outcomes (purpose) of the serious game, a document analysis on several GPM curricula has been conducted. These are further supported the performed literature study and expert interview, which has resulted into a final list of intended learning outcomes and is described in Chapter 4.

To create the TO-BE situation, the intended learning outcomes have been encoded into the serious game design using the newly assembled framework. The framework has been assembled using existing systematic design approaches such as the design, play, and experience (DPE) (Winn, 2008) and game-based learning (Freitas & Staalduinen, 2011) framework. The conducted expert interviews, literature and document studies allowed us make informed decisions on our serious game design, which has been described in Chapter 5.

The snowballing method (Jalali & Wohlin, 2012) has been used to obtain literature and has been performed by searching for keywords in several databases, and reading the article to determine the relevance. The references from papers that were found relevant have been used to obtain more literature, thus the snowballing method. For scientific research papers, scientific databases such as Google Scholar, PubMed, SSCI, Scopus were used. Due to the young nature of the field, non-scientific literature also known as grey literature has been used. For non-scientific research, literature from congresses such as Games for Health and Game Research for Training and Entertainment (GATE) have been used. In addition developer and game news websites, blogs and forums have been used for more knowledge on related serious games.

2.2.4 Demonstration

A prototype has been developed to demonstrate the serious game design and helped us conduct the evaluation. The prototype is a web-based serious game, based on the intended learning outcomes, serious game design and assembled framework. Based on the conducted evaluation, the prototype could be used for further research and implemented improvements derived from the evaluations.

2.2.5 Evaluation

Demonstrating the prototype should lead to a serious game that allows GPs to experience what it is like to run a general practice, while teaching them about GPM. This should prepare them in starting or taking over a general practice, by making them aware of the decisions they may encounter in their professional career. It is however important to conduct an evaluation to measure the effect of the serious game, because many serious games are considered ineffective (O'Neil, Wainess, & Baker, 2005).

Chapter 6 describes the evaluation approach as well as the analysis and results of the evaluation. The study has used experts to evaluate the derived intended learning outcomes and serious game design. These experts were familiar with the AS-IS situation, which allows them to compare it to the TO-BE situation. Unfortunately, no GP students could be found to measure the effectiveness of the serious game. The evaluation should lead to further research, improvements of the prototype and input for further development of the serious game.

2.2.6 Communication

This thesis contains all the information on the conducted study such as the scientific foundation, evaluation and results. Moreover, a research paper has been written for a conference. The evaluation, results and feedback have led to conclusions, which determined the quality of applying a serious game for GPM in the Dutch context. Table 2.1 maps the research activities with the sub-questions to show their relevance.

	SQ1	SQ2	SQ3	SQ4	SQ5	SQ 6
Literature study	x	х	x	x	x	
Document analysis			х	х		
Expert interviews			х	х		
Serious game design				х		
Demonstration					х	х
Evaluation						х

The artifacts created for this study are:

- AS-IS overview:
 - Intended learning outcomes for GPM;
 - Related serious games;
 - Serious game design approaches.
- TO-BE:
 - Proposed framework;
 - Serious game design;
 - Prototype;
 - Thesis and research publication paper.

2.3 Validity and reliability

To deliver a high-quality contribution to science and society, it is required to determine the study's validity and reliability. This section elaborates on the different types of validity and reliability. It discusses the criteria that has to be met as well as the decisions to meet this criteria.

2.3.1 Construct validity

Construct validity reflects to what extent the operational measures that were studied really represent what the researcher had in mind and what is investigated according to the research questions. To ensure this, a clear description of the research approach has been described and approved before conducting the study. Multiple sources have been used for the literature study. All artifacts created, have been documented and saved. Finally, multiple peer-review moments have been held.

2.3.2 External validity

External validity reflects to what extent it is possible to generalize findings and to what extent these findings are of interest to other people outside the investigated case. Therefore, experts of the GP domain have been included to determine the validity of the intended learning outcomes, serious game design and prototype. To achieve a higher generalizability multiple evaluations have been conducted.

2.3.3 Reliability

Reliability reflects to what extent the data and the analysis are dependent on specific researchers. If another researcher would conduct the same study, the results should be the same. To achieve reliability a complete and clear description of the research process has been described and references have been provided. Moreover, the conducted interviews have been recorded and some have been transcribed. Both the recordings and transcriptions can be provided upon request.

2.3.4 Internal validity

Internal validity is concerned with causal relationships. When investigating whether one factor affects another investigated factor, there is a risk that the investigated factor is affected by a third factor. In this study, we have used scientific theory for all the artifacts. For the evaluation, a sample has been used that is familiar with the AS-IS situation. This allowed them to compare it with the TO-BE situation, using multiple evaluation methods. Participants have only participated in the evaluation once to discard validity treats.

3. A design framework for serious games

This chapter describes what serious games are, lessons learned on related serious games and how they can be designed. The first section of this chapter introduces the concept and added value of serious games. The second section provides an overview on design guidelines, player experiences and lessons learned on related serious games for this study. The third section describes how serious games can be designed, using a systematic approach. The final section describes the proposed framework that has been assembled, using the key elements of the design process and has been used for this study to cope with the limitations of the existing ones.

3.1 What are serious games?

Over the last decade the serious game market has been growing expeditiously and it is expected that the value of the total market will grow between 2015 and 2020 at an estimated CAGR (Compound Annual Growth Rate) of 16.38%, most of which is accounted for by the education segment (MarketsandMarkets, 2015). Besides education, serious games are applied in many segments, such as the healthcare, government and military (Susi, Johannesson, & Backlund, 2007).

Edutainment, game-based learning, and digital game-based learning are domains that are related to and overlap the serious game domain. Education through entertainment, called edutainment was popular when the PC market was growing rapidly in the nineties (Michael & Chen, 2005). Edutainment are both digital and non-digital games that have educational goals and focuses mainly on young children. Game-based learning (GBL) and digital game-based learning (DGBL) are often depicted as the same concept, although DGBL only involves digital games. Both paradigms rely on games that are designed with an educational purpose and define learning outcomes. DGBL is based on the fact that the today's learners have been raised digitally, thus possessing a way of thinking and processing information that is different from those of the previous generation (Prensky, 2001). Authors such as Corti (2006) argue that DGBL is the same concept as serious gaming. He defines DGBL (serious gaming) as: "*leveraging the power of computer games to captivate and engage end-users for a specific purpose, such as to develop new knowledge and skills*". Although it focuses on using computer games for a specific purpose, studies such (Breuer & Bente, 2010) as state that serious gaming is broader than DGBL.

Studying literature on serious gaming reveals different definitions. Sawyer (2004) defines serious games as: "[any] computerized game whose chief mission is not entertainment [including] entertainment games which can be reapplied to a different mission other than entertainment." Michael & Chen (2005) argue that serious games are: "games that do not have entertainment, enjoyment, or fun as their primary purpose." The definition of Zyda (2005) does specifically depict entertainment as an important component and argues that a serious game is more than software. He defines a serious game as: "a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives." Despite the differences in definitions, they agree that serious games are not primarily focused on entertainment.

Michael & Chen (2005) argue that there are important differences between entertainment games and serious games from a development and design perspective. While serious games have the intention of teaching the player something, entertainment games mostly focus on having fun. Moreover, serious games provide the player with a problem solving experience and entertainment games mostly provide much action. Furthermore, simulations in serious games respond to decisions that players make, while

entertainment games often provide random events and effects. Finally, serious games should reflect natural communication, because delays and misunderstandings may occur such as in real-life. Entertainment games often provide communication without misconception and delays, thus is perfect.

Serious games have proven effective to promote learning (Van Eck, 2006), teach knowledge (Wouters, van der Spek, & van Oostendorp, 2009), can create simulations of a specific environment (Squire & Jenkins, 2003) and train cognitive skills (Mitchell, 2004). Moreover, it allows players to experience situations that cost too much money and time in a real-life situation (Corti, 2006). Furthermore, Ellis, Heppell, Kirriemuir, Krotoski, & McFarlane (2006) argue that serious games can promote communication, collaboration, lateral thinking and teamwork. Finally, serious games add value due to:

- 1. The involvement of the users. Participants can learn, experiment, train and practice in a more attractive way than traditional education (Prensky, 2007).
- 2. The possibility to let participants make decisions in a risky and complex situation in a safe way (Squire & Jenkins, 2003).
- 3. The possibility to let participants complete their learning process on their own level and pace (Yusoff, Crowder, Gilbert, & Wills, 2009).
- 4. The possibility to apply learning analytics, where participants receive immediate and effective feedback (Crookall, 2010).
- 5. The possibility to let participants compete as groups with each other. This way groups can learn from each other (Kirriemuir & McFarlane, 2003).

A bad habit that often occurs in the serious game domain is that (educational) content is poured into games in an ad hoc and inappropriate manner, assuming that playing a game unquestionably motivates players to learn (Gunter, Kenny, & Vick, 2006). This creates serious games, where players may not achieve the intended learning outcomes and thus become a useless educational tool. Moreover, the authors argue that players will become bored if no game design principles are used. Therefore, Gunter, Kenny, & Vick (2006) argue that a formal design paradigm is needed to design "effective" serious games that are educational sound and use game design principles to engage players.

For example, in the study by Lindh & Hrastinski (2008) 67 students responded to a survey on a simulation game. Most students found the simulation game not representative for the real-world and not more effective than traditional methods. Another example is the study by Cameron & Dwyer (2005), which showed that using a serious game did not improve retention when comparing it to a group of students that did not use the game. To fully benefit from the above mentioned advantages and cope with the bad habits, several authors such as Freitas & Staalduinen (2011) and Winn (2008) have created systematic design approaches (frameworks) to create successful serious games. This is described in the Section 3.3.

3.2 Related serious games for healthcare management

This section discusses the design guidelines, player experiences and lessons learned on related serious games for healthcare professionals and organizations. This provides us with a useful overview of related serious games that can be used as inspiration for this study. Moreover, for each game the positive and negative points have been stated and form the (anti-)requirements for the game.

3.2.1 Heartbeat

Heartbeat is a serious game where players are working at the Heartbeat Medical Center (MC) and is meant to create awareness on how a hospital operates (Q-Academy, 2015). During the game, players experience challenges that the Heartbeat MC faces on a daily basis and learn how to deal with these challenges successfully. Optimizing the primary process, gain control over the administrative processes and coping proactively with stakeholders are the three main challenges.

The serious game is played in an offline setting (one room) with 16 to 20 players whom each have a management, primary process or administrative role. One day of playing represents a number of fictitious hospital years and the serious game itself lasts between 5 and 7 hours. The target audience of the game are managers, medical specialists and nurses.

Players have the common goal to turn the Heartbeat MC into a successful hospital. The serious game simulates various processes such patients arriving at the clinic. These patients are examined, operated and stay in the hospital for a few days for recovery. Meanwhile the secondary processes such as finance, negotiations with health insurers and administration run in parallel.

After playing the serious game the participants should have gained insight into trends and developments within hospital care, experienced the importance of collaboration effectively and the interdependence between primary and secondary processes. Furthermore, participants should have experienced cohesion between external developments and internal capabilities and different roles that exist within the hospital.

Although no paper is available on this related game, the participants shared their experiences for the serious game. The participants liked the roleplaying that were related to specific tasks, which created awareness on the jobs and tasks their colleagues performed. Moreover, they liked the small scale simulation of a hospital, which made them understand the big picture on how a hospital operates. Finally, they became aware of the many challenges a hospital faces each day. A screenshot Heartbeat is presented in Figure 3.1.



Figure 3.1: Heartbeat (Q-Academy, 2015)

This serious game has been chosen for analysis, because the managing activities of a hospital are closely related to those of a general practice. Unfortunately, no elaborated evaluation and effectiveness study was conducted for this serious game. However, the video evaluation does show

that awareness can be created by simulating a hospital environment. The positive and negative points for the game are:

- + Simulating processes and roles similar to those of a general practice can create awareness.
- The serious game does not focus on GPM.
- No detailed serious game design has been provided.

3.2.2 The HAN-healthcare game

The HAN-healthcare game is a serious game that allows players to experience the importance of integrated care collaboration hands-on (Bogers, Westerman, Faber-de Lange, & Weijers, 2014). The primary goal of the serious game is to create awareness for integrated care, while teaching players the knowledge and skills required for integrated care. Like Heartbeat, the game is played offline with cards and forms to make the process visible and as realistic as possible. Another reason the game is played offline, is to experience direct communication and confrontation between players. The serious game takes about two-three hours to play and the target audience are healthcare professionals working in healthcare organizations.

The HAN-healthcare game is played within three rounds, where the player is assigned a role such as a GP or co-assistant in round one. In the beginning of round one the GP refers patients with different complaints to the hospital. Within the hospital the players perform various symbolic treatments and with the help of administrative paperwork the patients are directed throughout the various departments. This is done by randomly setting up tables that represent different departments within the room where the game is played. After each round the players receive feedback on their waiting times, costs and quality by a key performance indicator (KPI) tool. Under time pressure, the player has to create a maximum of 3 improvement that they want implement in the next round. The players receive real-time feedback after playing all three rounds.

After playing the HAN-healthcare serious game, participants should be able to organize clinical pathways and administrative paperwork from an integrated care perspective. Moreover, they should understand the effect of treating as many patients as possible on the waiting and lead-times. Furthermore, they should be able to prioritize activities and deal with limited resources. Finally, they should be able to improve existing processes concerning integrated care.

The evaluation of the game was twofold, firstly, the game results were evaluated per round. Based on the game results per round, a conclusion could be drawn that there was an increased learning effect. In the first round every participant scored bad, meaning they did not treat all the patients and the hospital was full. Many mistakes were made with the patients that were treated. The game results of the participants improved dramatically in the second and third round after receiving feedback. Secondly, the participants commented on the game and were asked if they had learned anything. Participants said that the poor performance in the first round, made them want to improve dramatically. Moreover, they thought the serious game was more fun and effective than traditional teaching methods. Finally, they thought it was instructive to experience dealing with time pressure and having limited resources available. A screenshot of the HAN-healthcare game is presented in Figure 3.2.



Figure 3.2: HAN-healthcare game (Bogers et al., 2014)

This serious game has been chosen for analysis, because integrated care is an important aspect of GP care and is becoming significantly more important in the future. The evaluation shows that the in-game results can be used to measure the learning effect, while the comments of the participants can measure the engagement. The positive and negative points for the game are:

- + Simulating processes and roles on integrated care, which are a part of GPM can create awareness and increase learning.
- The serious game does not focus on GPM.
- No detailed serious game design has been provided.

3.2.3 eMedOffice

As in the Netherlands, preparing GPs to start or take over a general practice is an important challenge. Therefore, the serious game eMedOffice (Hannig, Kuth, Özman, Jonas, & Spreckelsen, 2012) was developed to teach GPs the conceptual and organizational basics of a general practice by creating a problem-based learning environment (Hannig et al., 2012). The serious game provides a practical approach on teaching students about the optimization of interior design, equipment and workflows. Thus, the main learning outcome is that players should learn to react to problems from staff and patients that are caused by suboptimal arrangements.

In the first phase, functionalities have to be assigned to rooms in the general practice by the player, which is done by placing furniture and equipment. In the second phase the player opens the general practice, so that the simulation starts. Actors such as patients and doctor assistants enter the general practice and start interacting with each other, using the furniture and equipment. If a problem is detected by the agent while performing a workforce-task, players will be informed. Examples of problems are missing furniture and/or equipment in rooms with a specific functionality, which are encoded into the game as rules that create restrictions in the game. These rules also check the usability and composition, which determines the score of the player.

The serious game has been integrated and evaluated in the curricular courses at the RWTH Aachen University Medical School. The evaluation of eMedOffice was conducted in twofold, using a questionnaire and a self-report quantitative evaluation. The usability was measured with a questionnaire consisting of 22 items and a sample of 27 participants. The items scaled from one (worst) to five (best) and asked the participants on the quality of the serious game, which was perceived highly with an average score of 4.07. The self-report quantitative evaluation was used to determine if the

serious game supported the learning processes, using a sample of 41 participants. The self-report sheet was filled out before and after playing the serious game, concluding it had a positive learning effect, create valuable discussions and collaboration among participants. A screenshot of eMedOffice is presented in Figure 3.3.



Figure 3.3: eMedOffice (Hannig et al., 2012)

This serious game has been chosen for analysis, because the paper started on management and organization of a general practice. However, eventually focused on a small and specific topic in the end. Despite that, the evaluation shows that a digital serious game can be useful to simulate a general practice environment.

Moreover, the evaluation shows that an increased learning effect can be achieved with a serious game. The positive and negative points for the game are:

- + The serious game focuses on GPM.
- + Simulating GPM in a virtual environment can increase learning and is considered useful
- The serious game only focuses on a small part of GPM.
- No detailed serious game design has been provided.

3.3 Serious game design approaches

As described earlier, creating an effective serious game require proper serious game design approaches, otherwise risk of failure exists. There are multiple systematic design approaches available that describe that provide guidelines on how to design and assess serious games.

Examples are frameworks where key elements of the design process are highlighted, such as the - design, play and experience (DPE) (Winn, 2008), - game-based learning (GBL) (Freitas & Staalduinen, 2011) and - serious game design assessment (SGDA) framework (Mitgutsch & Alvarado, 2012). Moreover, serious game design patterns (SGDP) that provide reusable solutions to frequently occurring problems for a specific context (Huynh-kim-bang, Wisdom, & Labat, 2010). The next subsections elaborates on these approaches.

3.3.1 The Design, Play and Experience framework

The DPE framework shown in Figure 3.4 expands on the Mechanics-Dynamics-Aesthetics (MDA) framework (Hunicke, LeBlanc, & Zubek, 2004), emphasizes the importance of serious games design and uses an iterative design process. The framework represents the relationship between the designer who designs the game and the player who plays the game, resulting into a player's experience. The DPE framework consists of five layers that influence each other, i.e. the learning, storytelling, gameplay, user experience and technology layer. These layers are combined with the design, play and experience aspects and create subcomponents of serious game design.

Firstly, in the **learning** layer, the designer defines the learning outcomes that the player should experience. Secondly, the designer meets these learning outcomes by designing the **content and pedagogy**. The **storytelling** layer depicts the story from the designer's perspective by providing a purpose and context. The story created by the designer and the interactions with the player, comprises the story that the player experiences.



Figure 3.4: Design, Play and Experience framework (Winn, 2008).

The **gameplay** layer defines the choices the player makes in the game and what the consequences are in the course of the game. The designer creates the **mechanics** of the game by defining what the player's interactions, challenges and (affective) goals are. These result into dynamics, which is the player's behavior and is influenced by the player's interaction. This creates player's experiences and emotions, which are the affects. The **user experience** layer is the most visible for the player and illustrates the design of the game with the user interface. The designer creates the **user interface**, while the player interacts with it and should become engaged in their play experience. Finally the serious game is built upon the **technology** layer that supports the other layers. Choosing a certain technology can influence design choices due to dependency (Winn, 2008).

3.3.2 The Game-Based Learning framework

The GBL framework has been developed to design and assess serious games. It can potentially be used to map the design of existing serious games. The framework is four dimensional, consists of a three columns that provide game design attributes that can be used as a checklist for game designers and is shown in Figure 3.5.



Figure 3.5: The Game-Based Learning framework (Freitas & Staalduinen, 2011).

The starting point is the **learning column**, which defines the learning objectives, clear player goals and the learning content. The learning objectives define what the designer wants the player to learn, i.e. the learning outcomes. The player goals are the in-game goals and are different than the learning objectives, because they do not necessarily align. The learning content represents the topic and subjects that have to be taught. The second column is **instructional design** and focuses on the learning cycle. Within this learning cycle, the player's behavior (actions) should provide feedback, so the player becomes engaged in the game, which should result into learning.

The third and last column is assessment and consists of **debriefing and system feedback**, which lead to learning outcomes within a specific context. The debriefing is an evaluation that is held with the players and instructor after the game, to discuss the outcomes and experiences. The system feedback provides the players with the in-game scores and results.

As shown in Figure 3.5 the framework also contain **four categories of game elements** that overlap and relate to the three columns and subcomponents. The four game element categories each have their own subset of game elements and are presented in Table 3.1. The authors emphasize the important of the relationships between these components to create an effective game design (Freitas & Staalduinen, 2011).

Context: Fantasy Goals/Objectives Language/Communication Mystery Pieces or Players Player Composition Rules Theme	Learning specifics: • Challenge • Conflict • Progress		
Representation: Action-Domain Link Control Interaction (Equipment) Interaction (Interpersonal) Location Problem-Learner Link Representation Sensory Stimuli	 Pedagogy: Adaptation Assessment/Feedback Debriefing/Evaluation Instructions/Help/Hints Safety 		

Table 3.1: Four game element categories with subsets (Freitas & Staalduinen, 2011).

3.3.3 The Serious Game Design Assessment framework

The SGDA framework has been developed to assess serious games, but can also be used to design serious games and is shown in Figure 3.6. The authors argue that there is a lack of knowledge on how a valuable discussion on serious game should be structured and therefore proposed the framework that consists of six design elements. They also argue that the purpose of the serious game needs to be coherently reflected in the design, to avoid **incoherence** and lack of **cohesiveness**.



Figure 3.6: Serious Game Design Assessment framework (Mitgutsch & Alvarado, 2012).

The first element defines the start of the game design and involves the **purpose** of the game. A serious game is created for a specific purpose, if the game does not impact on the player, it misses its purpose. Therefore, the purpose is defined by the aim of the serious game and designer's goals that should have impact on the player. The second element is the **content and information**, which presents the data in the serious game that is used by the player. More specific the data should be valid, approachable and fact-based.

The third element, the **game mechanics** define the possible interactions of the player within the serious game. Moreover, the framework suggests amongst others, the in-game goals, rules, main challenges and winning conditions as sub-elements of the game mechanics. The fourth element, **fiction and narrative**, provides a fictional context for the serious game and should be related to the purpose. This game designer can design the story for the player or allow the player to create its own story, by providing a mechanics-based space.

The fifth element, the **aesthetics and graphics** represent all the visuals such as the art for the serious game. It structures the content, mechanics, context and implements in the Graphical User Interface (GUI). The sixth and last element **frames** the previous five key design elements and defines the target audience and genre of the serious game. It also consists of the play literacy of the target audience, which is often neglected (Mitgutsch & Alvarado, 2012).

3.3.4 Serious Game Design Patterns

While the previous frameworks highlight the key elements of a serious game design, design patterns are reusable solutions to frequently occurring problems for a specific context. Huynh-kim-bang, Wisdom, & Labat (2010) analyzed 20 serious games to derive these patterns that can be used to design serious games. These design patterns are based on engagement (fun), instructive interaction and acquisition of knowledge/skills. Before using these patterns, the authors state that is important to **formulate educational objectives** for the serious game. The design patterns are divided amongst six categories that help answer a design problem when attempting to encode instruction and/or fun into a serious game.

The first category helps answer the question "when do you need to combine entertainment and *learning?*" and contains patterns that focus on the serious game **context**, i.e. combining instructive interaction and fun without making compromises. The second, third and fourth category contain patterns that focus on **learning aspects** of a serious game. The second category contains patterns that answer the question of "how to make interaction instructive?" and provides solutions to problems how to encode certain **types of knowledge** into a serious game. For example, build and/or modify a micro world to create awareness on abstract concepts. The third category provides solution patterns on "how to imitate the reflective process?" to help learners understand what they are doing and learning. An example is providing intensified instructive interaction phases for training and relaxed phases for thought and **reflection**.

The fourth category deploys patterns that answer "How to convey information without disturbing game immersion?", which provides solutions on players can discover knowledge without disturbing the game flow by implementing extra phases in the game. An example is to provide players with informative loading screens. The fifth and sixth category contain patterns that contribute to fun aspects of the game. The fifth category provide design patterns on "how to motivate users?" and is divided into sub-categories, i.e. fun reward and fun context. For example to motivate and encourage users to advance in the game, a graduation ceremony and/or narrative structure could be implemented into the serious game. The sixth and final category contains patterns that provides

solutions to "*how to help users advance in the game*", which focuses on keeping the serious game **challenging** for the players. Challenges in the game should not be too difficult to avoid frustration, while challenges that are too simple will probably bore players. The six categories contain 35 patterns and in total and are shown in Figure 3.7.



Figure 3.7: Serious Game Design Patterns (Huynh-kim-bang et al., 2010)

3.3.5 Analysis of the approaches

This section describes the coherence between the four approaches by highlighting the key elements of the serious game design process. To avoid confusion with game elements, the coherent key elements in the serious game design process are now be referred to as key steps.

Firstly, the four approaches agree that the design of a serious game should start with what the player should learn and experience, which can be depicted as **defining intended learning outcomes** and is presented in Figure 3.8. In the DPE framework, it is mentioned that the designer should define learning outcomes for the desired experience first and then design the content and pedagogy for those learning outcomes. Therefore, the content and pedagogy subcomponent has been left out in this key step and moved to the second step that is described later on.

In the GBL framework this step is stated by the learning column, starting with the learning objectives. The framework defines the clear player goals as in-game objectives and therefore also have been

moved to the second key step. The learning content should be designed based on the learning objectives and therefore are also moved to the second key step.

In the SGDA framework the purpose of the serious game is mentioned as a starting-point, by defining the aim of the serious game and the impact it should have on the player. The SGDP require the educational objectives for the serious game to be stated before using them.

Therefore, the first key step in the proposed framework are to define the intended learning outcomes, which state what players should be able to do or know after playing the serious game. The intended learning outcomes are not the same as the game objectives, but are to be seen from an educational point of view.



Figure 3.8: Intended learning outcomes as a starting point

As mention previously, the four approaches indicate that the intended learning outcomes need to be encoded into a **game design** for the serious game to reflect the game's purpose. The approaches provide important **game elements** and **instructional modes** that need to be considered during the game design process and are shown in Figure 3.9.

In the learning layer of the DPE framework, the content and pedagogy should be designed to meet the intended learning outcomes. Furthermore, the storytelling layer that creates the story, depicts the character, setting (context) and narrative as important game elements. Finally, the gameplay layer regard the mechanics as important game elements. These game elements can also be linked to instructional modes, which can be used to describe how the knowledge transition is facilitated in the serious game in terms of the instructional design.

The GBL framework also agrees that the game elements and instructional modes should meet the intended learning outcomes to reflect the serious game's purpose. The framework presents game elements that are divided over four categories and are shown in Table 3.1. Moreover, the learning content and player goals subcomponents of the learning column also meet the intended learning outcomes and are in-game related and are therefore depicted as game elements. Furthermore, the GBL framework describes an instructional design that implies that a player's behavior are complimented by sufficient feedback, which should provide the player with engagement and trigger learning.

In the SGDA framework the content, information, game mechanics, fiction, narrative, aesthetics, graphics and framing game elements are based on the intended learning outcomes (purpose) of the game. Moreover, the game mechanics should described the instruction for the serious game. The SGDP does not provide game elements, but provides solutions to instructional design problems by employing patterns. This can be used when encoding the intended learning outcomes into a serious game design.

We can conclude that multiple game elements such as the story, mechanics and content overlap in the three frameworks and are important for serious game design. However, no consent can be found on the exact game elements. Moreover, we can conclude that instructional modes are important to consider when designing a serious game and are often related to game elements. Therefore, the second key step in the proposed framework is the serious game design, which consists of game elements and instructional modes that should be considered during the design process.



Figure 3.9: Encoding intended learning outcomes into a game design

Finally, the three frameworks focus on **evaluating** the serious game design, which is often translated to a working prototype. The evaluation of the three frameworks focuses on determining whether the intended learning outcomes are the actual **learning outcomes**. Moreover, if the game elements provide the intended fun and learning **experience**, which is presented in Figure 3.10.

In the DPE framework this is shown by the arrows referring back from the experience aspect to the design aspect. The experience aspect evaluates if the intended learning outcomes and experiences were met through the design. Moreover, the serious game design is presented through a user interface that is supported by the technology layer. In the GBL framework, evaluation is provided by the debriefing and system feedback in the assessment column. This aligns with the debriefing/evaluation game element in the pedagogy category.

The SGDA framework has been developed as an assessment framework and emphasizes the importance of cohesiveness and coherence of the six elements. This allows evaluation of whether the holistic design of the game reflects the purpose. The SGDP do not specially mention evaluation, however Huynh-kim-bang et al. (2010) mention that "patterns must be adapted to the type of game,

and not all are adaptable to every circumstance". Therefore, the used patterns for a serious game should be evaluated to determine if they were used adequately in providing an **instructional design**.



Figure 3.10: Evaluation of serious game design

Analyzing these four approaches, we depict similarities by identifying key steps in the serious game design process. However, there are also differences between the four approaches. Moreover, most approaches are abstract (high-level), not holistic and do not provide concrete elements to design serious games. Therefore, we feel that none of the four approaches will be sufficient to describe the serious game design process. Thus, we propose a new framework that combines these approaches using the key steps in the serious game design process to cope with the limitations of the existing approaches. Section 3.4 describes the proposed framework in detail and is based on the previous analysis. Our frameworks also helps reaching consensus regarding the game elements.

3.3.6 Alternative approaches to serious game design

This subsection describes some other serious game design approaches that were not included in this study to provide a larger overview of available approaches.

Aleven, Myers, Easterday, & Ogan (2010) present a framework to design educational games and consists of existing three components. These components are the learning objectives, the previous described MDA framework (Hunicke et al., 2004) and instructional principles. The authors state the learning objectives should be identified early in the design process, matching the knowledge level of the players. Like in the MDA framework, the game designer needs to design game mechanics, which have effect on the dynamics and aesthetics. The authors state that the instructional principles should be research-based and contribute to a coherent story, which shows how the game supports learning. This basis of this framework aligns with our new proposed framework, but is still high-level.

LEGADEE is another serious game design approach for "learning games", which is model-driven and presented as an online collaboration tool (Marfisi-Schottman, 2012). This tool provides a methodology and toolbars that are adapted to the role of the participant to provide guidance in the design process

of the game. Examples of participants are clients, teachers, game designers and developers. LEGADEE also provides a model for creating an innovative Learning Game scenario, which allows the educational structure of the pedagogical expert to be integrated with the scenario designed by the game designer. Unlike the other approaches, LEGADEE has been implemented in a design environment, which makes it a different approach.

Tang & Hanneghan (2008) also define a different approach to serious game design by presenting a Domain Specific Modelling Language (DSML), which has been derived by analyzing existing software modeling languages and takes requirements into account. The DSML framework allows modelling for two types, i.e. data and visual modelling. The data model should describe the objects, flow and processes. The visual model should describe the positioning of the in-game components. This approach is very technical compared to our approach and does not take assessment and adaptation into account.

Although many more approaches exist, a brief overview of the serious game design approach landscape has been provided. We can conclude that each approach takes a different point of view to serious game design and that not one approach covers all the aspects.

3.4 Proposed framework for serious game design

This section describes the proposed framework, which is used for this study and is based on the analysis described in the previous section. Although only four approaches have been used as input and more exist, a hands-on overview of the serious game design process can be depicted. The proposed framework consists of three key steps, i.e. define intended learning outcomes, game design and the evaluation. These are described in detail in the following subsections and an overview is provided in Figure 3.11.



Figure 3.11: Proposed framework for serious game design

3.4.1 Define intended learning outcomes

In the first key step of the framework, the intended learning outcomes for the serious game are defined. So what are intended learning outcomes? To improve the traditional way of describing qualifications in education, the Bologna Agreement (European Higher Education Area, 2009) has determined that starting 2010 third-level institutions in the European Union should describe their qualifications in terms of learning outcomes. This capitalizes on trends that show that the traditional teacher-centered approach is shifting to a student-centered approach. The student centered-approach focuses on what students are able to do at the end of a course instead of focusing on just teaching (Kennedy, Hyland, & Ryan, 2007). The statements for this student centered-approach are called intended learning outcomes.

The European Commission (2009) defines learning outcomes as follows: "Learning outcomes are verifiable statements of what learners who have obtained a particular qualification, or completed a program or its components, are expected to know, understand and be able to do."

A frequently used approach of describing learning outcomes, is the use of Bloom's taxonomy of educational objectives, which categorizes three domains of educational activities and provides a readymade structure as well as a list of verbs. The three domains are cognitive (knowledge), affective (attitude) and psychomotor (skills), where the cognitive domain is used most for writing learning outcomes and is depicted in Figure 3.12 (Bloom & Krathwohl, 1956).



Figure 3.12: Bloom's Taxonomy: cognitive domain

Anderson, Krathwohl, & Bloom (2001) redefine the cognitive (knowledge) domain as the intersection of two dimensions, i.e. the cognitive process and knowledge dimension to improve the usability. This revision is based on the original taxonomy by Bloom & Krathwohl (1956). The cognitive process dimension presents an increasing cognitive complexity and is presented in Table 3.2.

Table 3.2: Cognitive process dimension (Anderson et al., 2001).

Cognitive proc	Cognitive process dimension				
Remember	Retrieving relevant knowledge from long-term memory.				
Understand	Determining the meaning of instructional messages, including oral,				
	written, and graphic communication.				
Apply	Carrying out or using a procedure in a given situation				
Analyze	Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose				
Evaluate	Making judgments based on criteria and standards.				
Create	Putting elements together to form a novel, coherent whole or make an original product				

The knowledge dimension contains four types of knowledge that have to be acquired or constructed and ranges from concrete to abstract and is shown and described in Table 3.3.

Knowledge dimension			
Factual	The basic elements that students must know to be acquainted with		
Concentual	The interrelationships among the basic elements within a larger		
conceptual	structure that enable them to function together		
Procedural	How to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.		
Metacognitive	Knowledge of cognition in general as well as awareness and knowledge of one's own cognition.		

Table 3.3: Knowledge dimension (Anderson et al., 2001).

The matrix that presents the revision of bloom's taxonomy and matches the cognitive process with the knowledge dimension is presented in Table 3.4. The taxonomy table can be used to visually represent classified learning outcomes for a course. Statements for learning outcomes always contain an action verb and an object, which is mostly a noun. The action verb is usually assigned to the intended cognitive process, while the object usually describes the knowledge that should be acquired or constructed (Anderson et al., 2001). A correct example of a learning outcome is shown below.

"Students should be able to examine a patient extra-orally or intra-orally".

Table 3.4 is filled with examples of learning outcomes created by Heer (2012) that respond to interaction of the two dimensions. The numbers in the table depicts the required skill-level of the learning outcomes, one being the lowest and nine being the highest. The following sections describes the performed document studies on several GPM curricula deriving intended learning outcomes for the serious game using this taxonomy.
Cognitive process dimension							
	Lower thinking skills Higher thinking skills						hinking skills
		Remember	Understand	Apply	Analyze	Evaluate	Create
		List	Summarize	Respond	Select	Check	Generate
		primary and	features of a	to frequently	the most	for	a log of daily
g	Factual	secondary	new	asked	complete list	consistency	activities
led	Fuctuur	colors	product	questions	of activities	among	
≥ S						sources	
<u>k</u>		(1)	(2)	(3)	(4)	(5)	(6)
ete		Recognize	Classify	Provide	Differentiate	Determine	Assemble
sio	Concentual	symptoms of	adhesives by	advice to	high and low	relevance of	a team of
S e	conceptuur	exhaustion	toxicity	novices	culture.	results	experts
l III		(2)	(3)	(4)	(5)	(6)	(7)
e B B	Procedural	Recall	Clarify	Carry out	Integrate	Judge	Design
▼ ed		how to	Assembly	pH tests of	compliance	efficiency of	an efficient
l w l		perform	instructions	water	with	sampling	project
Kn c Jec		CPR.		samples.	regulations	techniques	workflow
 		(3)	(4)	(5)	(6)	(7)	(8)
		Identify	Predict	Use	Deconstruct	Reflect	Create
		strategies for	one's	techniques	one's biases	on one's	an
	Meta	retaining	response to	that match		progress.	innovative
Ak	cognitive	information	culture shock	one's			learning
				strengths			portfolio
		(4)	(5)	(6)	(7)	(8)	(9)

Table 3.4: Revision of Bloom's taxonomy table (Anderson et al., 2001; Heer, 2012)

What the intended learning outcomes for the serious game in this study are and how they have been derived is described in Chapter 4.

3.4.2 Game design

The second step of the framework encodes the intended learning outcomes into a serious game design, which consist of **game elements** and **instructional modes**. As described in the previous section, no definite list of game elements that should be considered exists. Furthermore, the ones described in the existing frameworks are open for interpretation and combining them may lead to contradiction. Therefore, the formal and dramatic game elements from the "*Game Design Workshop: A Playcentric Approach to Creating Innovative Games* (Fullerton, 2008)" have been used as a guideline. Although the game elements do not especially focus on serious games, they do overlap with the before mentioned game elements and are described in detail. Moreover, serious games are still games.

The book by Fullerton (2008) is based on the core game design curriculum at the University of Southern California (USC) and many prominent game designers have contributed to it. The book is considered a "must have" by many readers in the game industry and has been widely accepted and cited. The formal elements describe and form the structure of the game, creating the game experience. The dramatic elements provide context to the gameplay, integrate the before mentioned formal elements and create emotional engagement for the players.

The formal elements consist of players, objectives, procedures, rules, resources, conflicts, boundaries, and outcomes. They are to be seen as conceptual tools that can help us make design decisions for the serious game. The interrelationship of these formal elements form the game design foundation. The first formal element are the **players** and is concerned with inviting players to play, numbers of players, role of players and player interaction patterns. **Invitations to play** the game deals creating an engaging

invitation to get players excited to play our serious game. The **number of players** speaks for itself and players can have different **roles** in the game, which should be described. The **player interaction patterns** are the structure of the interaction between the player and the game, and potentially other players. Examples are single player versus the game or player versus player. The **objectives** define what the player should try to achieve within the rules of the game and give players something to aim for. Objectives should be challenging, but achievable and can be used to set the tone of the game. Multiple players may have the same, different objectives or mini-objectives to achieve the main objective.

The **procedures** are the actions and the play methods that players can do to accomplish the defined game objectives. It is important for the procedure to define who can use it, e.g. one or multiple players. Moreover, what does the player do and when does the procedure occur. Furthermore, it is important to define when it takes place, i.e. in a specific state of the game or time frame. Finally, defining how players are able to access the procedure. There are four common type of procedures. The **starting action** is a procedure that puts the game into play, while the **progression of action** are ongoing procedures after the starting action. The **special actions** involve conditional procedures only available in relation to other elements or the game state. Finally the **resolving actions** closeout the gameplay.

The **rules** define the actions that allowed for the players and the game objectives. It is important to define how the players learn the rules and how they are defined. Furthermore, rules can be bound to specific situations. Creating too many rules may discourage players, while unstated and poor communicated rules may confuse players. **Resources** are assets that can be used to achieve specific goals. The designer's job is to determine how and when a player can access resources. The resources have to be useful for the game, while they also have to be scarce to challenge the player. Examples of resources are lives, actions, currency and amount of actions. When players try to achieve goals within the rules and boundaries of the game, **conflict** develops. Conflict can be created by rules, procedures or situations that disallow players to achieve goals and can create competition. Furthermore, obstacles, opponents and dilemmas can be used to create conflict. **Boundaries** are used to separate the game from things outside the game. This prohibits the game elements to interact with the non-game elements. **Outcomes** of the game and must be unpredictable to keep the player engaged. Although not all games have definitive outcomes, they depend on the interaction pattern and objectives. Most games have a win-condition, but other outcomes exist.

Dramatic elements makes game emotionally engaging by blending the formal elements into a meaningful experience. It provides context to the game by providing challenge, play, world building and the dramatic arc. Other dramatic elements such as the story, premise and character provide a deeper sense and enriches the player's overall experience. **Challenge** is one of the tools to engage a player and providing it is essential. Incorporating challenge is difficult, because it is very individualized. While a child may consider math to be difficult, an adult may find it not challenging. In addition, a challenging task in the beginning of the task may not be challenging at a later stage of the game, meaning it is dynamic.

To cope with this, the **theory of flow** (Csikszentmihalyi, 1990) has been used as a guideline. The theory of flow has an uprising path between challenge and ability for tasks that has to stay in balance. If the challenge is too high for a player with a low ability the player will become frustrated, while the player will become bored if they have level of ability and the challenge is too low. Csikszentmihalyi (1990) provides conditions that have to be met for challenge. He argues that challenge skills, because flows often takes place within tasks that are bounded by rules and goal directed. Moreover, players become aware and involved in the game if all the player's relevant skills are used. To maintain the flow, he argues that clear goals and feedback has to be provided. Furthermore, the player should be

concentrated on the task he is performing by removing other distractions and providing a clear GUI (Graphical User Interface). The game should also provide the player with useful choices, without unassuming outcomes and complete control. Finally, players should lose their sense of self-consciousness and have their perception of time transformed from hours to minutes.

Play is presented with the freedom of movement within a rigid structure. For game the rules and procedures comprise the structure, while the play within the structure is the player's freedom bounded by the rules. This provides the player with an emergent experience and personal expression. Furthermore, Bartle (1996) defines different **type of players** that have to be taken into account such as the competitor that wants to beat other players, the collector that wants to acquire things and the director that wants to be in charge. The **premise** defines the action of the game within a setting or a metaphor, making the game less abstract. With a good premise, the backstory does not have to be provided.

In a game, the drama is told by the actions of the **characters** and are the representation of the player. Characters can be based on psychological base by acting as a mirror for the target audience fears and desires. Moreover, they can be symbolic by standing for larger ideas or historic, referring to real-world figures. The main character in a game's story is the protagonist that creates the conflict that comprises the story by engaging the problem. Another representation of players in-game, are **avatars** that are often created by the player's themselves. These avatars tend to create more empathy as characters are that driven by a story. Characters and avatars can be three different degrees of freedom, which are player controlled, Artificial Intelligence (AI) controlled or a mix of both.

The **story** of the game should be uncertain and the player's job is to resolve this. In most games the story is an extended version of the premise and is used as a backstory that provides context and a setting. However, this method does not affect the game because it progresses from one story to the next in a linear way. Another method called branching, allows players to change the story's structure by their choices and also affect the outcome of the game. Different choices lead to different outcomes. Choosing one of these methods often depends on the genre of the game. The concept of **world building** is the creation of a fictional world by a deep and complex design such as maps. It may help keeping players engaged over time. The **dramatic arc** is the dramatic conflict, which is different than the formal conflict and creates tension in the game. The conflict in the game is considered the most important and can be encountered by the player with obstacles, dilemmas or other players. In most games, tension gets rises before it becomes decrease, thus the dramatic arc. Implementing a dramatic arc in the game, helps the player come more engaged over time.

As described earlier, some game elements such as the game mechanics are linked to **instructional modes** and are used to describe the instructional design. This describes how the learning process, i.e. knowledge transition is facilitated for the serious game. For our framework we have used the design patterns from Huynh-kim-bang et al. (2010), which has been adopted to the type of serious game for this study. Because the serious game focuses on teaching GPM within the Dutch context, thus is very specific, we believe that **domain knowledge** influences the serious game design. The serious game design for this study is described in Chapter 5.

3.4.3 Evaluation

The third step of the framework **evaluates** the serious game, which requires transferring the serious game design into a working **prototype**, so that players can play and experience the serious game. This way, the designer can determine the extent to which the stated intended learning outcomes match with the **actual learning outcomes** after playing the game. Moreover, if the developed serious game design in the second step provides the intended fun and learning **experience**. Finally, if the serious game design provides an adequate learning process through the created **instructional design**. It is possible to use the proposed framework as a checklist, to determine if the key steps and subcomponents are present. This allows for an iterative process, so that improvements can be implemented.

Multiple evaluation approaches and methods can be used for evaluating serious games. The four serious game design approaches do not specify this. Therefore, they are not included in this framework. The evaluation for this study is described in Chapter 6.

4. Intended learning outcomes for general practice management

In the previous chapter we have proposed a serious game design framework, which stated that defining the intended learning outcomes is the first key step in the serious game design process. This chapter gathers, analyzes and selects intended learning outcomes for the serious game. The first section describes the GP educational program in the Netherlands. The second section describes the document analysis of the GPM curriculum in the Netherlands to determine the intended learning outcomes as stated by the governing institute. In the third section, a document analysis of international GPM curricula is described and compared to the Dutch curriculum. The fourth section describes the performed literature study on important aspects for GPM, which has been compared to the intended learning outcomes of the curricula. In the fifth section, we report on a conducted expert interview on GPM. The sixth and final section scopes and determines the final intended learning outcomes for the serious game.

4.1 GP educational program in the Netherlands

This section describes the GP educational program in the Netherlands (NL). Moreover, it describes the new Dutch national education plan for GPs (Huisartsopleiding Nederland, 2014b). This plan contains information on what GPs should know and are able to do upon completing their educational program.

In the Netherlands eight universities (institutes) offer education for GPs. They currently share a curriculum which is based on a framework (Huisartsopleiding Nederland, 2005) that is created in collaboration with the eight universities and contains the objectives of the GP education. The objectives are attached to competence profiles and end terms. The competence profiles depict competences (skills) that a GP should master upon completing their educational program and are shown in Table 4.1 (Nederlands Huisartsen Genootschap, 2009). The end terms are stated as intended learning outcomes, which depicts what a GP should know and is able to do at the end of the study.

The universities are mandated to follow the structure of the framework curriculum, which consists of three compulsory and three elective modules. The courses in the curriculum are intertwined with the competence profiles. GPM is taught in the third year, which consists of training in a general practice and curricular education.

Competence	Description
Medical expert	Medical activities the GP engages in response to complaints, problems and questions concerning health and illness. The core activities consists of differentiation of the complaint to the nature and severity and to assess the need for intervention. A treatment plan is generated starting from a hypothesis and the effect is monitored.
Communication	Verbal and non-verbal communication between doctor and patient during (telephone) consultation, visit or via email. The core activities consists of initiating and constructing a constructive dialogue with the patient and making a medically responsible joint decision.
Collaboration	Interpersonal relationships within the general practice, with other GPs and outside healthcare providers. The core activities consists of participating in a network of functional partnerships and making optimum use of available expertise is essential for realizing effective and efficient cooperation
Organize	Realizing rules and agreements serving the function of the general practice within a system of quality standards. The core activities consists of continuous monitoring the quality of the general practice using relevant indicators.
Act responsibly	Weighing interests of the patients against the interests of other patients and social interests. The core activities consists of being socially responsible when performing the GP profession.
Knowledge and science	Acquisition, use and transfer of scientific knowledge and common experience and systematized knowledge. The core activities consists of using the principles of Evidence-Based Medicine (EBM), which is an approach to optimize decision-making by using evidence from well conducted research (Evidence-Based Medicine Working Group, 1992).
Professionalism	Managing, promote and maintain professionalism. The core activities consists of reflecting own competences in a critical way.

 Table 4.1: Competence profiles general practitioners (Nederlands Huisartsen Genootschap, 2009)

However, a new national GP education plan will be launched in 2016 that consists of themes and Distinctive Professional Activities (DPAs). The themes consists of a coherent set of DPAs, which are occupational activities that a GP should be able to understand and do upon completing their educational program. Thus, the DPAs can be depicted intended learning outcomes. Each theme has its own DPAs that should be addressed during the GP educational program, either in a general practice or curricular education. In the new plan the competences described in Table 4.1 are combined with the themes and DPAs, while the end terms have been replaced by the DPAs (Huisartsopleiding Nederland, 2014b).

The new plan has been developed to reach an agreement on the goals of GP education by making informed choices, because not all occupational activities in the GP educational program can have explicit attention due to time limitations. The themes and DPAs can be used by universities (institutes) to design the curriculum, while GP trainers can use them as a guide while teaching in a general practice. The themes of the new plan are presented in Table 4.2 (Huisartsopleiding Nederland, 2014c).

Table 4.2: Themes and KBAs GP education (Huisartsopleiding Nederland, 2014d)

Themes	Description
Short term care	Biggest part of care delivered by GP, where medical care is provided within one to a maximum of three consultations. These consultations take place at the general practice, via telephone, at the patient or by staff in a support role.
Emergency care	Emergency care in the general practice, after clinic hours, where knowledge of procedures and agreements are very important.
Chronic care	Care for chronically ill patients, such as diabetes, asthma and cardiovascular diseases.
Elderly care with	Care for elderly that have complex problems in multiple domains (e.g.
complex problems	physical and/or mental) that have a negative influence on each other.
Child care	Care for children, where development and growth have an influence on the prevention of diseases, prognosis of diseases and the effect of treatments.
Patient care with	Care for patients that suffer from mental health problems and
mental problems and/or	disorders. Mostly consists of patients with light and/or common mental
disorders.	health problems and disorders.
Patient care with SOLK	Care for patients with somatic insufficiently explained physical complaints (<i>Somatisch onvoldoende verklaarde lichamelijke klachten</i> , SOLK).
Palliative and terminal care	Proving palliative and terminal care for patients by coordinating activities for the patient and relatives.
Prevention	Preventing complications and diseases by early detection and protection to keep patients healthy.
General practice	Concerns the general practice as an organization and defines activities
management	that a GP should master to contribute to a well-organized and
	performing organization. This applies to the owner of the general
	practice, the GP in service of another GP and the locum.

As shown in Table 4.2, the new plan contains a theme that specifically focuses on GPM. This theme and related DPAs are discussed in the next section.

4.2 GPM curriculum in the Netherlands

In this section, a document analysis of the GPM theme and related DPAs is described. The serious game in this study focuses on GPM within the Dutch context, thus uses the GPM theme as a basis for intended learning outcomes. The curriculum (Huisartsopleiding Nederland, 2014a) has been translated from Dutch into English, to be able to perform the document analysis.

The GPM curriculum contains seven DPAs that are related to the seven keywords. The DPAs describe the keywords by providing concrete descriptions of what a GP should be able to do or know after the study. Therefore the DPAs can be depicted as learning outcomes. Furthermore, descriptions have been provided for each DPA and an overview of what is expected of the DPA is being presented. These descriptions can be depicted as sub-learning outcomes, as they also state what a GP should be able to do or know after the study. Thus, the DPAs can be depicted as umbrella terms (broader categories) for the descriptions. The original GPM theme, including related DPAs, sub-learning outcomes and competences is presented in Appendix A. From our analysis of the curriculum we can remark that the keywords and their DPAs do not always cover all of their descriptions (sub-learning outcomes). For example, the keyword of the first DPA "vision" does not serve the descriptions (sub-learning outcomes), which is described in Section 4.2.1. Moreover, the DPAs and their descriptions are open for interpretation as they are described only briefly. Therefore, we normalize the curriculum to capture the essence of GPM, by creating new topics that have a main learning outcome and contain sub-learning outcomes. The normalization process is described in the following subsections. The tables that contain "keyword" are originally translated from the curriculum, while the tables containing "topic" are the normalized version of the curriculum.

4.2.1 Keyword "vision"

Firstly, the DPA of the keyword "vision" is shown in Table 4.3. The DPA states that a GP should be able to "develop a personal vision on GP care as well as a vision for the general practice providing the GP care". This aligns with the keyword, however looking at the descriptions, broader definitions have been provided.

1. Keyword vision	
DPA	Develops a personal vision on GP care as well as a vision for the general practice providing the GP care.
Sub-descriptions of the DPA	 Formulates what he think is good GP care and what kind of GP he wants to be for his patients. Keeps himself informed of developments in the field in which the general practice operates. Reflects upon the organization of the own general practice in terms of strengths and weaknesses and personal goals. Creates a proposal for the development of the general practice based was the provide mention of the based was the based was the provide mention.
of the DPA	 wants to be for his patients. 1.2. Keeps himself informed of developments in the field in which the general practice operates. 1.3. Reflects upon the organization of the own general practice in terms of strengths and weaknesses and personal goals. 1.4. Creates a proposal for the development of the general practice based upon the previous mentioned sub-learning outcomes.

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l able 4.3: DPA	keyword visio	n for the theme	<i>' GPIVI</i> (Huisartsopi	eiding Nederland,	2014a)

While description 1.1 can be depicted as creating a vision, the other sub-learning outcomes build upon the developed vision. Because the serious game focuses on GPM, we merge the personal and GPM vision into the learning outcome "*A GP should be able to develop a vision for the general practice*". Description 1.2 and 1.3 could potentially be seen as a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. For GPM (Dijkers, Nijland, & in 't Veld, 2011). Description 1.2 focuses on staying up-to-date of developments in the field in which the general practice operates. This can be depicted as looking for opportunities or potential threats. Description 1.3 relates to reflecting upon the strengths and weaknesses of the general practice, which also aligns with the SWOT analysis. Finally, description 1.4 states that GPs should be able to create a proposal for the development of the general practice based on sub-learning outcomes 1.1, 1.2 and 1.3. This can be characterized as defining goals and an action plan for the vision that has been formulated.

This is supported by (Dijkers et al., 2011), who describe these activities as a part of creating a business plan for conducting GPM, i.e. setting out a strategy. Moreover, the authors depict developing a vision as the first activity of the business plan, which is presented in Appendix B. Thus, we propose to change the keyword "vision" into the topic "strategy", because the DPA focuses on setting out a strategy (direction) for the general practice. Therefore, we also change the main learning outcome into "a GP should be able to set out a strategy for the general practice." This constitutes a better umbrella for the sub-learning outcomes. The results are shown in Table 4.4.

Table 4.4: The topic strategy for GPM

1. Topic strategy			
Main-learning outcome	A GP should be able to set out a strategy for the general practice.		
Sub-learning outcomes	A GP should be able to:		
	 Develop a vision for the general practice. 		
	• Create a SWOT analysis for the general practice.		
	• Create a proposal for general practice development.		

4.2.2 Keyword "systematic improvement"

The second DPA is related to the keyword "systematic improvement" and is presented in Table 4.5. The DPA defines that a GP should be able to "*Create an improvement plan and implements it*", which aligns with the keyword. We believe that the definition of the DPA is sufficient and captures the essence of the topic, although the descriptions could be simplified.

Table 4.5: DPA keyword systematic improvement for the theme GPM (Huisartsopleiding Nederland, 2014a)

2. Keyword systematic improvement		
DPA	Creates an improvement plan and implements it	
Sub-descriptions	2.1. Formulates a plan for improvement plan for general practice	
of the DPA	 management or medical practice (analysis, improvement plan and evaluation plan). 2.2. Creates a budget. 2.3. Establishes support from the general practice staff for the improvement plan. 2.4. Acts as a project manager for the improvement plan. 	

Description 2.1 mentions the formulation of an improvement plan and aligns with the creation of the improvement plan. Description 2.4 states that the GP should act as a project manager and can be depicted as implementing the improvement plan. Furthermore creating a budget (2.2) could be considered a part of creating an improvement plan, while establishing support for the improvement plan (2.3) can be depicted as part of implementing the improvement plan together with other staff members.

Thus, the topic of the DPA remains "systematic improvement", while the main learning outcome is changed into "A GP should be able to manage systematic improvement activities for the general practice" to serve as an umbrella concept for the sub-learning outcomes. The results are shown in Table 4.6.

Table 4.6: The topic systematic improvement for GPM

2. Topic systematic improvement			
Main-learning outcome	A GP should be able to manage improvement activities for the general		
	practice.		
Sub-learning outcomes	A GP should be able to:		
	Create an improvement plan		
	Implement this improvement plan		

4.2.3 Keyword "supervision"

The third DPA presented in Table 4.7 is related to the keyword "*supervision*" and defines that a GP should be able to "*Supervise staff members in the general practice performing defined actions*". This aligns with the keyword, but the descriptions require a broader definition of the DPA and keyword.

3. Keyword supervision		
DPA	Supervises staff members in the general practice performing defined actions.	
Sub-descriptions of the DPA	3.1. Knows the tasks and competences of the practice assistant and practice nurse.	
	3.2. Evaluates the performance of the practice assistant and practice nurse.	
	3.3. Delegates tasks to the practice assistant, practice nurse and other general practice staff.	
	3.4. Provides feedback on the performance of the practice assistant and practice nurse.	
	3.5. Supervises a general practice staff member when learning a medical activity or action.	

Table 4.7: DPA keyword supervision for the theme GPM (Huisartsopleiding Nederland, 2014a)

Description 3.1 is concerned with understanding what the tasks and competences of staff members are. Description 3.2, 3.3 and 3.4 deal with managing staff, because it focuses on evaluating the performance, providing feedback and delegating tasks to staff. Finally, 3.5 involves teaching and guiding staff members who are learning new medical activities or actions and aligns best with the DPA.

Therefore, we propose to change the keyword "supervision" into the topic "staff", because the DPA focuses on managing and developing staff members. Thus, we also change the main learning outcome to "A GP should be able to manage and develop staff member skills of the general practice.", so that it serves as an umbrella for the sub-learning outcomes. The results are shown in Table 4.8.

Table 4.8: The topic staff for GPM

3. Topic staff			
Main-learning outcome	A GP should be able to manage and develop staff member skills of the		
	general practice		
Sub-learning outcomes	A GP should be able to:		
	 Know the tasks and competences of staff members 		
	 Evaluate the performance of staff members 		
	 Delegate tasks to staff members 		
	 Provide feedback on the performance of staff members 		
	• Supervise staff when they learn a new medical expertise		

4.2.4 Keyword "patient safety"

The fourth DPA is related to the keyword "patient safety" and is shown in Table 4.9. The DPA defines that a GP should be able to "Contribute to patient safety by reporting, analyzing and dealing with safety problems of patients" and adheres the keyword. We believe that the definition of the DPA is sufficient and captures the essence of the topic, however should be divided into a main learning outcome and their specific sub-learning outcomes.

4. Keyword patient	t safety
DPA	Contributes to patient safety by reporting, analyzing and dealing with safety issues of patients.
Sub-descriptions of the DPA	 4.1. Recognizes unsafe situations, in the form of errors/mistakes, mistakes about to happen and potential dangerous situations. 4.2. Uses the report incidents safely (<i>veilig incidenten melden</i>, VIM) procedure, which refers to reporting incidents in a safe way. 4.3. Analyzes unsafe situations (reported incidents) and denominates weak links in the healthcare system (structures, processes, procedures or persons). 4.4. Creates a plan to improve safety of patients. 4.5. Implements and evaluates an improvement plan (is a role model, convinces team members of the necessity of the changes, stimulates employees in implementing the change).
	4.6. Contributes to a safe incident reporting environment (culture) in the general practice that is used for training.

Table 4.9: DPA keyword patient safety for the theme GPM (Huisartsopleiding Nederland, 2014a)

The DPA already includes some of the sub-learning outcomes, i.e. reporting (4.2) and analyzing (4.3) patient safety issues. Moreover, dealing with patient safety issues could be considered as creating (4.4), implementing (4.5) and evaluating (4.5) an improvement plan. Finally the essence of the DPA can be depicted by contributing to patient safety (4.6). Logically, this process starts with recognition that there are patient safety issues (4.1).

Thus, the topic of the DPA remains "*patient safety*", while the main learning outcome is changed into "A GP should be able to organize patient safety activities within the general practice." The results are shown in Table 4.10.

4. Topic patient safety			
Main-learning outcome	A GP should be able to organize patient safety activities within the		
	general practice.		
Sub-learning outcomes	A GP should be able to:		
	 Recognize patient safety issues 		
	 Report patient safety issues using VIM 		
	 Analyze patient safety issues 		
	 Create improvement plan for patient safety issues 		
	 Implement improvement plan for patient safety issues 		

Table 4.10: The topic patient safety for GPM

4.2.5 Keyword "finance and business management"

The fifth DPA is related to the keyword "finance and business management" and is shown in Table 4.11Table 4.5. The DPA defines that a GP "has insight in the financing and business management of general practices, claims/declares the expenses of own operations and advises patients on financial consequences of a medical treatment/diagnostics." This aligns with the keyword, but when looking at the descriptions it mostly focuses on financial management.

Evaluate improvement plan for patient safety issues

Table 4.11: DPA keyword	finance and business n	nanagement for the theme	GPM (Huisartsopleiding Nederla	and, 2014a)
	J			

5. Keyword finance	5. Keyword finance and business management						
DPA	Has insight in the financing and business management of general practices, claims/declares the expenses of own operations and advises patients on financial consequences of a medical treatment/diagnostics.						
Sub-descriptions of the DPA	 5.1. Keeps own knowledge of healthcare financing up-to-date, such as knowledge of negotiation results LHV and other parties and understands the relevance for the general practice and patients. 5.2. Understands financing structures concerning primary and integrated care. 5.3. Knows the key developments and its relevance for his/her practice and patients (WMO, AWBZ and supplementary insurance policies and the 						
	 position of the municipalities). 5.4. Understands the incomes and expenses of the general practice. 5.5. Claims their own operations. 5.6. Advises patients on the financial consequences of a medical treatment/diagnostics. 5.7. Reckons with patients using personal finances, the relevance of an (additional) insurance policy and handles accordingly. 						

The DPA already contains some of the sub-learning outcomes, i.e. understanding financing structures that are related to the general practice (5.2 and 5.4). Claiming their own operations (5.5) and advising patients on financial consequences of a medical treatment/diagnostics (5.6 and 5.7). Finally, the descriptions define that a GP should stay up-to-date on the healthcare financial structures and key developments in the environment of the general practice (5.1 and 5.3).

Therefore, we propose to change the keyword "finance and business management" into the topic "Finance", because the DPA focuses on understanding and managing finances of a general practice. Thus, we also change the main learning outcome into "A GP should be able to manage finances of a general practice." The results are shown in Table 4.12.

5. Topic finance				
Main-learning outcome	A GP should be able to manage the finances of a general practice.			
Sub-learning outcomes	A GP should be able to:			
	 Stay up-to-date on healthcare financing structure 			
	• Stay up-to-date on key developments in the environment of the general practice			
	 Understanding financing structures related to the general practice 			
	Claim their own operations			
	 Advise patients on financial consequences of a medical treatment/diagnostics 			

Table 4.12: The topic finance for GPM

4.2.6 Keyword "multidisciplinary team"

The sixth DPA is related to the keyword "multidisciplinary team" and is shown in Table 4.13. The DPA defines that a GP "*Represents the general practice for a specific theme in a multidisciplinary team.*" and aligns with the keyword. However, the descriptions suggest a broader scope that focuses on three activities.

6. Keyword multidisciplinary team						
DPA	Represents the general practice for a specific theme in a multidisciplinary team.					
Sub-descriptions	6.1. Understands the goal of multidisciplinary collaboration.					
of the DPA	6.2. Be aware of his/her role and position and that of other parties in consultations.					
	6.3. Chooses a role consciously: that of practitioner, expert, or representative of the general practice or group of general practices.					
	6.4. Applies discussion and negotiating skills					
	6.5. Makes appointments on the sharing of responsibilities.					
	6.6. Chairs meetings, create agendas and create/discuss a list of decision					
	6.7. Evaluates the importance of the outcome of consultations for the provision of primary care and reports to the general practice team.					

Table 4.13: DPA keyword multidisciplinary team for the theme GPM (Huisartsopleiding Nederland, 2014a)

The first activity focuses on understanding the goal of multidisciplinary collaboration (6.1). The second activity can be depicted as establishing multidisciplinary collaboration by being aware of their role (6.2) and choosing a role (6.3) in meetings. Moreover this activity, on using skills such as applying discussion and negotiating skills (6.4) in the meetings. Finally, by chairing meetings (6.6) and agreeing on responsibilities (6.5). The third activity is evaluating the outcomes of the meetings for the general practice (6.7).

We therefore propose to change the keyword "*multidisciplinary team*" into the topic "*multidisciplinary collaboration*", because if focuses on collaboration with other healthcare professionals and organizations. The main learning outcome has been changed to "A GP should be able to coordinate multidisciplinary collaboration." The results are shown in Table 4.14.

Table 4.14: The topic multidisciplinary collaboration for GPM

6. Topic multidisciplinary collaboration					
Main-learning outcome	A GP should be able to coordinate multidisciplinary collaboration.				
Sub-learning outcomes	A GP should be able to:				
	• Understand the goal and value of multidisciplinary collaboration.				
	Establish multidisciplinary collaboration.				
	• Evaluate the outcomes of the multidisciplinary collaboration for				
	the general practice.				

4.2.7 Keyword "patient relationship and information provision"

The seventh DPA is related to the keyword "patient relationship and information provision" and shown in Table 4.15Table 4.5. The DPA defines that a GP should "adapt general practice management and information provision to the needs of the patient population." and aligns with the keyword. We believe that the definition of the DPA is sufficient and captures the essence of the topic, however the description can be simplified, because it focuses on analyzing the population and adapting the general practice to those needs.

Table 4.15: DPA keyword patient relationship and information provision for the theme GPM (Huisartsopleiding Nederland,2014a)

7. Keyword patient relationship and information provision					
DPA	Adapts general practice management and information provision to the needs				
	of the patient population.				
Sub-descriptions	7.1. Creates an analyses of the composition of the general practice on the				
of the DPA	base of epidemiology, social-economic status (SES) and ethnicity.				
	7.2. Analyzes how patients are informed about medical affairs/issues, procedures and organization of the general practice.				
	7.3. Orients on and uses the possibilities of social media and digital communication.				
	7.4. Determines if adaptions in the providing of information are necessary based on the analysis mentioned in the previous bullet points and if so, which ones.				

Description 7.1 focuses on creating an analysis of the composition of the general practice, i.e. demographically and health characteristics. Moreover, description 7.2 is concerned with analyzing how patients are informed on general practice related information. These are examples of possible needs the population of the general practice may have. Description 7.3 mentions the orientation and use of social media and digital communication, which can be considered a solution to problems identified in the analysis and related to the DPA. The last description (7.4) states that a GP should be able to determine if adaptions in the provision of information are necessary, based on the analysis mentioned in the previous descriptions.

Therefore, we propose to change the keyword of "*patient relationship and information provision*" into the topic "*patient population*", because the DPA focuses on analyzing and adapting to the needs of the patient population. Thus, we also change the main learning outcome to "*a GP should be able to adapt general practice management to the needs of the patient population*", which provides an umbrella for the underlying descriptions. The results are shown in Table 4.16.

Table 4.16:	The topi	c population	for GPM
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7. Topic population				
Main-learning outcome	A GP should be able to adapt general practice management to the needs			
	of the patient population.			
Sub-learning outcomes	A GP should be able to:			
	 Analyze the needs of the patient population 			
	• Determine if adaptions for general practice management are			
	needed			

4.3 Document analysis of curricula from international universities

We aim to analyze the international curricula on cohesive elements to further support the intended learning outcomes. Therefore, a document analysis has been performed on international curricula and is described in this section.

This section describes the governing institutes and GP educational programs in Australia (AUS), Canada (CAN), New Zealand (NZ) and the United Kingdom (UK). These have been chosen upon availability, details of the curricula and because they were developed by governing institutes that define standards for the GP educational programs. Moreover, a document analysis on the GPM curriculum of these countries has been performed to support the newly derived topics and main learning outcomes of the Dutch curriculum and find cohesive elements. The document analysis is performed due to the lack of literature on GPM. Although the main learning outcomes are high-level, they can be depicted as important for GPM as they give an overview of what is expected of a GP. Each topic has been analyzed in their own subsection.

The RACGP (Royal Australian College of General Practitioners) governs the GP education in Australia. They are responsible for maintaining standards and quality for education, training and research. For their curriculum, Australia uses a framework that consists of five domains each having their own specific learning outcomes. Furthermore, the framework defines learning outcomes across the GP professional life, starting as a medical student and ending with continuing professional development. Finally, they provide specific learning outcomes for GPM (RACGP, 2015).

The CFCP (College of Family Physicians of Canada) is the governing institute for GP education in Canada. They establish training, education and certification standards and advocate on behalf of GPs. It also accredits postgraduate family medicine education in Canada's 17 medical schools. In Canada a GP is referred to as a family physician. Canada uses the framework CanMEDS-FM for GP education, which consists four of principles that are foundational concepts regarding the nature and practice of family medicine. It also depicts roles that have specific learning outcomes, such as the GP as a manager with related competences (CFPC, 2015).

The RNZCGP (The Royal New Zealand College of General Practitioners) is the governing institute of New Zealand and establishes standards for GP care. It also provides education and ongoing professional development for GPs. The curriculum provided by the RNZCGP is divided into six domains and contain 31 learning outcomes that are related to competences. Management is one of the domains and specifies learning outcomes for GPM (RNZCGP, 2015).

The RCGP (Royal College of General Practitioners) is the governing institute of the United Kingdom (UK), which establishes standards and promotes excellence in primary healthcare. Their curriculum defines what is required and expected of an independent GP by defining knowledge, skills and qualities. These are combined with learning and teaching activities. The curriculum contains six competences which are examined in depth by four contextual statements and complimented with clinical examples. The GPM learning outcomes are spread out over all the six competences (RCGP, 2015).

The next subsections matches the learning outcomes of the international curricula with the newly derived topics and their main learning outcomes of the Dutch curriculum¹. Moreover, the level of the cognitive process and knowledge dimension of the learning outcomes are compared using the revision

¹ http://www.janstrien.com/thesis/Learning_outcomes.xlsx

of Bloom's taxonomy. The matching summary is shown in Table 4.17 (CFPC, 2009; Huisartsopleiding Nederland, 2014a; RACGP, 2011a, 2011b; RCGP, 2010a, 2010b; RNZCGP, 2014).

		NL	AUS	CAN	NZ	UK
1. Strategy	V	Set out	Formulate	Organize	Develop	Develop
	Ν	A strategy	business plan	the general	strategic	management
				practice	planning	plans
2. Systematic	V	Manage	Apply	Participate	Undertake	Participate
improvement	Ν	improvement	Improvement	In	Improvement	In improving
		activities	activities	improvement	activities	organizational
				activities		performance
3. Staff	V	Manage and	Develop and	Manage and	Develop and	Develop and
		develop	lead	Facilitate	train	train
	Ν	staff members	Staff	human	staff	staff
				resources and		
		- ·	N.A. 116	education	-	
4. Patient	V	Organize	Modity	Participate	Ensure	Build and
satety				in maticut		ennance
	IN	patient safety	organizational	in patient	a safe practice	safety culture
		activities	risks to patient	sarety	for patients	
E Einanco	V	Manago	Salety	Manago	Identify	Interpret
5. Finance	V	finances	Evaluate	finances	financial	finances
	IN	nnances	inancing	nnances	implications	mances
6 Multidicci	V	Satur	Dovelop	Coordinato	Collaborato	Understand
o. Multiuisci-	V NI	multidiscipling	multidiscipling	With multiplo	with other	nood to work
collaboration	IN	nunuiscipiina	nutoom	caro providors	professionals	in partnorship
conaboration		collaboration	systemic	care providers	professionals	with other
		conaboration	approach			nrofessionals
			approach			and
						organizations
7. Population	V	Adapt	Respond	Respond	Develop	Tailor
	Ν	to needs of	to the needs	to the health	innovative	services to
		patient	of the	needs of the	strategies for	needs of
		population	community	communities	needs of the	population
			,		community	

Table 4.17: Matching learning outcomes in curricula (CFPC, 2009; Huisartsopleiding Nederland, 2014a; RACGP, 2011a,2011b; RCGP, 2010a, 2010b; RNZCGP, 2014). V are verbs and N are nouns.

4.3.1 Strategy

For the topic strategy, the level of the learning outcomes are the same for all countries, i.e. are positioned between "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension. However, differences occur in the formulation of the learning outcomes. The Netherlands aligns with Australia on the creation a business plan, while New Zealand focuses on developing strategic planning and the United Kingdom on developing management plans. Canada does not mention anything on plans, but provides a very broad definition of organizing the general practice which is not providing sufficient details.

However, we can conclude that setting out a strategy for the general practice is an important aspect of GPM.

4.3.2 Systematic improvement

Looking at the initial results of the topic, we can conclude that all countries depict systematic improvement as an important element of GPM. The biggest differences are depicted in the levels of the cognitive process dimension (verbs), as all countries except the Netherlands focus on the "apply" dimension. However, combining the verbs with the nouns, we can conclude that they focus on applying improvement activities and use an umbrella term. An example of such activities can be the creation and implementation of an improvement plan. Therefore, they are on the same level as the Netherlands, i.e. "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension.

Thus, we can conclude that improving the general practice is an important aspect of GPM.

4.3.3 Staff

The level of the learning outcomes for the topic staff are the same for all countries. They are positioned between "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension.

The conclusion is that an important aspect of GPM involves managing, developing and training staff members.

4.3.4 Patient safety

Despite the different choice of words by the countries, the level of the learning outcomes are the same for all countries. They are also positioned between "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension. All countries mention activities that involve creating a safe environment for patients in the general practice.

Therefore, we can conclude that patient safety in the general practice is an important aspect of GPM.

4.3.5 Finance

Contrary to the previous topic, there are differences in the topic "finance". The Netherlands and Canada state that a GP should be able to manage finances and belongs to the "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension. Australia depict that GPs should be able to evaluate financing options and is positioned between "Evaluate" of the cognitive process dimension and the "Procedural" of the knowledge dimension. The UK only mentions that finances needs to be interpreted by GPs, while New Zealand states that they should be able to identify financial implications. They both only focus on understanding finance, which positions them between "Understand" of the cognitive process dimension and the "Conceptual" of the knowledge dimension.

However, we can conclude that at least understanding finances of a general practice is important for GPM.

4.3.6 Multidisciplinary collaboration

The Netherlands, Australia and Canada state that a GP should be able to set-up or coordinate multidisciplinary collaboration, thus positioning them in the "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension. New Zealand only mentions that GPs should collaborate with other professionals, therefore positioning them in "Apply" of the cognitive process dimension and the "Procedural" of the knowledge dimension. Finally, the UK merely depicts that GPs should understand multidisciplinary collaboration, placing them in the "Understand" of the cognitive process dimension and the "Conceptual" of the knowledge dimension.

We can conclude that multidisciplinary collaboration is an important aspect of GPM and that GPs should focus on collaboration with other healthcare professionals and organizations.

4.3.7 Patient population

All countries position in the same level for the learning outcomes concerning the population, i.e. are positioned between "Create" of the cognitive process dimension and the "Metacognitive" of the knowledge dimension. They state that GPs should adapt, respond and tailor the general practice to the needs of their communities.

Therefore, we can conclude that GPs should provide population based healthcare and is to be depicted as an important aspect of GPM.

4.3.8 Conclusion

The results of the analysis on the skill level of thinking and knowledge for the learning outcomes is shown in Table 4.18, where the number one requires the lowest skill level and the number nine the highest skill level.

	Торіс	NL	AUS	CAN	NZ	UK
1	Strategy	9	9	9	9	9
2	Systematic improvement	9	9	9	9	9
3	Staff	9	9	9	9	9
4	Patient safety	9	9	9	9	9
5	Finance	9	7	9	3	3
6	Multidisciplinary collaboration	9	9	9	5	3
7	Patient population	9	9	9	9	9

Table 4.18: Matching learning outcomes in curricula on the skill level of thinking and knowledge

It can be concluded that that the topics and their main learning outcomes are important aspects of GPM. To summarize:

- A GP should be able to set out a strategy for the general practice.
- A GP should be able to manage improvement activities for the general practice.
- A GP should be able to manage and develop staff member skills of the general practice.
- A GP should be able to organize patient safety activities within the general practice.
- A GP should be able to manage finances of a general practice.
- A GP should be able to coordinate multidisciplinary collaboration.
- A GP should be able to adapt general practice management to the needs of the patient population.

4.4 Literature study on GPM

As stated earlier not much scientific literature is available on conducting GPM. However, we do want to use literature to further support the intended learning outcomes for the game. Therefore, the next subsection provides an overview of the available scientific literature for GPM.

4.4.1 Literature selection

The paper by Hofhuis, Meulen-arts, & Hingstman (2006) conducted a study on management in GP education in the Netherlands. It concluded that policy (strategy) making and leadership were the most important management skills for GPs. However, after the study two new education plans have been developed and the Dutch healthcare system has been changed, which may have changed this outcome.

Furthermore, one of the experts for this study has been included in the expert interviews in the next section. Therefore, we have initially excluded these outcomes.

Engels et al. (2005) developed a GPM framework consisting of quality indicators that are shared by six countries in Europe, including the Netherlands. This resulted into a framework with five domains, i.e. infrastructure, staff, information, finance, and quality and safety with a set of indicators. These domains and indicators were tested in a follow-up study, which described the evaluation and development of the European Practice Assessment (EPA) instrument and indicators (Engels et al., 2006). This resulted in a list of 75 quality indicators that the participating countries found valid amongst the five domains.

However, using the snowballing method a systematic review on key elements of high-quality practice organization in primary healthcare was found that included the previous two papers (Crossland, Janamian, & Jackson, 2014). The systematic review included a total of 31 studies and identified thirteen elements. Ten elements were often used in existing organizational assessment tools and three were considered important for quality improvement. This is the latest systematic review performed on GPM and we consider it as state-of-the-art. We also consider it to be the most useful source with the highest value that is based on literature. Therefore, this systematic review has been compared to the curricula in the next subsection.

4.4.2 Comparing the literature and the curriculum

This subsection compares the seven learning outcomes that were concluded from the curricula study with the thirteen elements of high quality management derived from literature.

The first element mentioned in the paper by Crossland, Janamian, & Jackson (2014), is **patientcentered care** and is about understanding the local community and tailoring services to their needs. This aligns with "a GP should be able to adapt general practice management to the needs of the patient population." from the curricula. The second element is **leadership and leading**, referring to being a leader in the general practice regardless of the role. The third element is the **focus on staff**, which includes managing staff including satisfaction and monitoring stress and workload. Both match with "a GP should be able to manage and develop staff member skills of the general practice." from the curricula. The fourth element **clinical governance** is concerned with ensuring effective care delivery and clinical safety by systems and structures and corresponds to "a GP should be able to organize patient safety activities within the general practice."

Multiprofessional teams is the fifth element and is about working effectively with multiprofessional teams to provide healthcare, which aligns with "a *GP should be able to coordinate multidisciplinary collaboration.*" The sixth element **communication**, refers to the informal and formal communication processes of the general practice. To be more precise, it is concerned with delegation and sharing of information internally and externally. Furthermore, cultural and environmental factors that allow effective cooperation between the general practice and outside providers. The delegation matches with the sub-learning outcomes of "a *GP should be able to manage and develop staff member skills of the general practice*". However, sharing of information and cooperation between the general practice and outside providers the general practice and outside providers the general practice *coordinate multidisciplinary collaboration*."

The seventh element **is education and training**, which deals with training staff to improve the quality focusing on education tailored to changes in the general practice. This corresponds to "a *GP should be able to manage and develop staff member skills of the general practice.*" of the curricula. The eight element **process improvement** is about improving clinical, healthcare and internal processes of the

general practice and aligns with "a GP should be able to manage improvement activities for the general practice."

Performance results is the ninth element and are supporting processes that report internal and external performance measurements. This does not really align with any of the intended learning outcomes for the curricula. However, the authors state that this is closely related to the tenth element **Information and information technology,** which depicts the use of IT and data to improve and support the general practice. This could be considered as an example of a solution to apply improvements to the general practice. Thus, it can be related to "*a GP should be able to manage improvement activities for the general practice.*"

Incentives and rewards is the eleventh element and is concerned with recognizing and rewarding staff financially and motivationally for performing on the job. This matches with "a *GP should be able to manage and develop staff member skills of the general practice.*", because it is one of the sub-intended learning outcomes. The twelfth element **organizational governance** aligns with "a *GP should be able to set out a strategy for the general practice*", because it is about defining a shared direction for the general practice such as vision, mission and strategic planning. **Change and change management** is the thirteenth element and depicts the ability of the general practice and staff to make, manage and sustain changes. This corresponds to "a *GP should be able to manage improvement activities for the general practice.*" of the curricula.

Finally Crossland, Janamian, & Jackson (2014) mention that the items are interrelated. We can conclude that the available literature also aligns with the intended learning outcomes from the curricula. The results are not really surprising as the references of the papers include many authors that have also worked on creating the GPM curricula.

4.5 Expert interview

The section describes the conducted expert interview that is used to further support, scope down and determine the final intended learning outcomes for the serious game. The goal of the interview was to learn more about the GP educational program and how GPM should be conducted. Moreover, to gather intended learning outcomes from a practical perspective, because the ones from the curricula and literature study are high-level and too broad. Furthermore, to understand what important performance indicators for GPM are that can depict how well the general practice is doing. Finally, recommendations for the learning process of the serious game.

Expert 1 is a former successful general practice owner in Maasdam with 33 years of experience. He is also a former board member of the NHG (Dutch GP society), teacher at Leiden University and holds a PhD in GPM. He is currently a commissioner of the VvAA, a service provider and membership organization for healthcare. He was also editor of the book on managing a general practice (Dijkers et al., 2011).

As stated in the problem statement, expert 1 mentions GPs in training and recently graduated GPs should experience what it is like to run a general practice before starting or taking one. This experience creates **awareness** on the decisions they encounter and allows better decisions making while managing and improving their own general practice, which is currently not available in the educational programs. Expert 1 agrees that right topics of GPM such as staffing and finance are being taught in the educational programs. However, he believes that this is insufficient to prepare GPs to start and/or take over a general practice, moreover contribute to the management of a general practice. To improve this, expert 1 defines a different approach to GPM that consists of three core aspects that are

interrelated and define a general practice. The three core aspects are the **patient population**, **healthcare tasks (services)** and **task delegation**.

The **patient population** is the community in which the general practice operates and contains the patients that visit the general practice. Each population has their own specific demographics and healthcare characteristics, which determine specific needs for healthcare. Expert 1 mentions that a GP should be able to understand these needs. The **healthcare tasks** are the services that the general practice provide and should align with their needs of the patient population. E.g. providing a special program for elderly with few elderly in the population would make no sense. Another important aspect is collaborating with other healthcare providers to provide integrated care for chronic diseases, which is compensated for by insurers. Expert 1 mentions that a GP should be able to organize these tasks and understand how they impact the population.

These provided healthcare **tasks should be delegated amongst the staff members** of the general practice. Firstly, Expert 1 mentions that a GP should hire a staff composition that **align with the population and provided tasks**. Secondly, expert 1 states that GPs should **delegate these healthcare tasks efficiently**, e.g. you can hire a GP to provide chronic care for COPD but a nurse practitioner also provide this for a lower salary. Finally, he mentions that teams could also collaborate on these aspects to provide cheaper healthcare with a higher quality.

Expert 1 mentions that these three core aspects comprise the **plan** a general practice owner should think about, when conducting GPM. This plan should be the starting point for every general practice. Expert 1 also mentions that the ability to adapt when internal and external **events** occur is another important aspect of GPM, because of the constantly changing healthcare and GP domain. For example, what to do if a general practice takes in 2,000 new patients due to another general practice going bankrupt. Do we hire new staff and/or do we hire a new building?

Conducting GPM leads to results, which can be depicted as key performance indicators (KPIs). Expert 1 refers to the triple aim framework that optimizes health system performances, which pursues three dimensions as an important benchmarking tool. These three dimensions consist of **reducing the per capita cost of health care**, **improving the health of populations** and **patient experience of care (satisfaction)**. In addition he mentions **employee satisfaction** and **financial health** of the general practice are important indicators of a general practice.

Finally, Expert 1 mentions two activities that are important in the GP educational process, which cannot be fully integrated into a digital game. First, he mentions that the game should be **supervised by a GP trainer**, so that he can monitor the plan and goals of the students that play the game. Furthermore, the GP trainer can intervene when a team is taking a wrong direction and monitor the group process to see whether everybody contributes. Secondly, he mentions that it is very important for GP students to learn from each other. Therefore, he proposes that a **classroom discussion and evaluation** after the game has been played. Players (the GP students) can elaborate on their plans and explain why they change or did not change their plans. Furthermore, they can show results of those plans and evaluate their experience.

4.6 Final intended learning outcomes for the serious game

This subsection determines the final intended learning outcomes for the serious game by applying criteria to the previously described intended learning outcomes, which have been derived from an educational, literature and practical perspective. As described earlier, we concluded that the intended learning outcomes from the curricula and literature are closely aligned, which was not very surprising

as both often have similar authors. Therefore, we apply criteria to the intended learning outcomes from the curricula and the expert interview shown in Table 4.19, as the literature merely depicts elements. This process allows us to scope and determine the final intended learning outcomes for the serious game.

Curricula	Expert interview
 Curricula A GP should be able to: Set out a strategy for the general practice. Manage improvement activities for the general practice. Manage and develop staff member skills of the general practice. Organize patient safety activities within the general practice. Manage finances of a general practice. 	 Expert interview A GP should be able to: Understand the needs of the patient population. Provide healthcare tasks that align with the needs of the patient population. Compose a staff composition with the population and provided tasks. Divide healthcare tasks efficiently amongst staff members. Create a plan for the general practice
 Manage finances of a general practice. Coordinate multidisciplinary collaboration. 	 Create a plan for the general practice based on the needs of the patient population.
 Adapt general practice management to the needs of the patient population. 	 Adapt when internal and external events occur. Understand how decisions influence the
	general practice.

Table 4.19: intended learning outcomes from curricula and expert interview

The criteria used to determine the final intended learning outcomes are:

- **Cohesiveness**: Are there cohesive intended learning outcomes? To answer this questions, we have looked for cohesive intended learning outcomes between the two perspectives.
- **Focus**: Can a set of intended learning outcomes focus on a specific aspect of GPM? To answer this question, we have looked for intended learning outcomes that can be grouped together and make sense. For example, a serious game on motivating staff that includes financial management of the general practice would make no sense.
- **Transferability**: are the intended learning outcomes transferable to a prototype? To answer this question the author, has taken his programming skills into account. In a professional setting this should not be criteria, but would be wise for this thesis as the author has limited programming skills. Moreover, if a learning activity for an intended learning outcomes would be transferable to a web-based prototype. For example, a serious game on motivating staff may be difficult as a learning activity.

Applying the criteria to the intended learning outcomes for the two perspectives, we have depicted that many intended learning outcomes are focused on aligning the general practice to the needs of the patient population. Firstly, both perspectives state intended learning outcomes to **understand and adapt GPM** to the **needs of the patient population**. Furthermore, the perspectives state intended learning outcomes that focus on determining a **plan/strategy** for the general practice, based on the serving population. Moreover, both perspectives depict intended learning outcomes that dealing with **staff** such as **delegating tasks**, where the expert interview specially mentioned the alignment with the population. The expert interview stated that provided **healthcare tasks** should be aligned with the

needs of the patient population, where coordinating multidisciplinary collaboration is often a part of. Therefore, we decided that the serious game should focus on **providing population-based healthcare** as most intended learning outcomes focus on this.

The remaining intended learning outcomes can be depicted as more generic. Managing improvement activities for the general practice is very broad and ad-hoc. Moreover, not much detailed information on organizing patient safety activities within the general practice could be found. Furthermore, the author thought both intended learning outcomes would be difficult to transfer to a serious game and therefore left out of the scope. **Managing finances** will always be important when managing a small organization. The same goes for **adapting GPM when internal and external events occur**, because of the many changes in the healthcare and GP domain. Finally, Expert 1 mention that GPs should experience general practice before starting or taking over a general practice, which should make them aware of the decisions that have to be made. Therefore, **understanding how decisions influence the general practice** is an important intended learning outcomes and should be included.

Now that the intended learning outcomes are scoped, most of them are still described too high-level and broad. Therefore, we have stated a specific set of intended learning outcomes that focus on specific learning activities. This helps us to transfer the intended learning outcomes to the prototype. Therefore, we decided to state the following intended learning outcomes for the serious game:

- ILO 1. A GP should be able to analyze the needs of the patient population.
- ILO 2. A GP should be able to select an adequate set of healthcare tasks.
- ILO 3. A GP should be able to adequately hire staff.
- ILO 4. A GP should be able to delegate tasks among staff.
- ILO 5. A GP should be able to set out a strategy for the general practice.
- ILO 6. A GP should be able to understand financial management of a general practice.
- ILO 7. A GP should be able to respond adequately when internal and external events occur.
- ILO 8. A GP should be able to understand how managerial decisions influence the general practice.

5. Serious game design and implementation

In the second step of the serious game design framework, the intended learning outcomes (ILOS) should be encoded into a serious game design. This chapter shows how we encode the intended learning outcomes into a justified serious game design, so that the purpose of the serious game can be fulfilled. For every game design decision made, both the intended learning outcomes from Chapter 4 and game design components from Chapter 3 are taken into account. Moreover, several performed interviews and literature on GPM have provided us with domain knowledge, which helped us with the content and instructional design of the serious game. One of the interviews with expert 2 can be found in Appendix C. This way we try to achieve the **game-based learning blend** that combines learning with fun (Huynh-kim-bang et al., 2010) The dramatic element **story** has been used throughout this chapter to explain how the game progresses, while the defined intended learning outcomes from Chapter 4 have been related to the serious game design and are shown as **ILO** including the corresponding number (e.g. **ILO 1**). The first section provides background information of the serious game, while the following sections describe the different mini-games. The final section briefly summarizes the serious game design.

5.1 Background information

The **purpose** of the serious game is to **create awareness of the core managerial business processes of a general practice** (Expert 1, personal communication, April 16, 2015), by allowing GPs (players) to run and make decisions on their own general practice from scratch in a virtual environment. This experience is intended to create awareness on the managerial decisions a GP has to make and the effects of these decisions by providing feedback. This virtual environment implements a micro world interaction that allows players to shape and revise the general practice as an organization, thereby creating awareness (Huynh-kim-bang et al., 2010). Therefore, the serious game has been named the "**General Practice Manager**".

The **target group (audience)** of the game are GP students and recently graduated students that are interested in starting or taking over a general practice, and aims to mitigate their dissatisfaction about their preparation in running an own general practice (Heiligers et al., 2014; van der Velden & Batenburg, 2011; van der Velden et al., 2005).

5.1.1 Main objective

The **main objective** for the player the game is to deliver patient population-based healthcare, one of the main real-life goals of the Ministry of Health, Welfare and Sport and grasps the focus of the intended learning outcomes (Nederlandse ZorgAutoriteit, 2014). To reach this objective, the player has to perform the core characteristics of GPM (**procedures**) (Expert 1, personal communication, April 16, 2015). These are:

- 1. Understanding the needs of the patient population (ILO 1, as defined in Chapter 4).
- 2. Acquire and organize healthcare tasks (services) that align with the needs of the patient population (ILO 2).
- 3. **Hiring staff** that align with the needs of the patient population and provided healthcare tasks (**ILO 3**).
- 4. Effectively delegate the provided healthcare tasks (services) (ILO 4).

Performing these procedures, allows the player to set out his/her own strategy for the general practice (**ILO 5**). During mini-game four, the player also has to respond to internal and external events that affect the general practice (**ILO 7**). The player receives feedback after each mini-game, which

represents how managerial decisions influence the general practice (**ILO 8**). This should awareness of the core managerial business processes such as financial management (**ILO 6**).

The player plays versus the game to provide the best population-based healthcare as possible (**players**). Moreover, **players** compete amongst each other to have the best running general practice (**player interaction patterns**). Providing competition between players with similar skills levels avoids discouragement and motivates the player (Huynh-kim-bang et al., 2010).

However, it is more important that players learn from each other's mistakes as each player will receive its own unique population and is elaborated on further in this chapter. This serious game may attract different player types (Bartle, 1996) such as the **competitor** that wants to complete with other players to run the best general practice. Moreover, the **director** because the player has much freedom of movement and can make his/her own decisions on how the general practice should operate (**play**).

5.1.2 Background story

To **engage the players** and get them excited to play our game, an **engaging invitation** has been created using a **background story** that is described in the next subsection. This background story will be displayed after logging in to the game. The background story of the game is as follows and has been described from the player's perspective.

"You have completed a six year medical doctor educational program and decided to specialize into GP. You entered the GP educational program and are now in your third year. You are currently working in the general practice of your GP trainer, who is also the owner and who will retire one year after you graduated. You are two months away from graduation and have the ambition of owning a general practice. You have set a meeting with your GP trainer, if it is possible to take over the general practice after he retires. During the meeting, the GP trainer asks you about your business plan for the general practice after taking over. After discussing the business plan, no agreement can be found on the future of the general practice as you want to follow a different direction (conflict, dramatic arc).

Therefore, you have started to look for a new career opportunity as you want to own a general practice and set out your own strategy. Fortunately, a new living area in the Netherlands is being developed, which is called "**name of the area**". You see an opportunity to start your own general practice in that area as the nearest general practice in that area is more than 15 minutes away, which is considered too far because a GP needs to be able to visit a patient within 15 minutes in case of an emergency (LHV & NPCF, 2015) (**rule**). You have sent a request to the municipality, which has been granted and allows you to start a general practice in that area (**world building**). Moreover, you are allowed to set out a strategy for the general practice (**ILO 5**). Because you recently graduated and are inexperienced, the municipality will construct the general practice and provide you with necessary basic equipment. This is paid back with a monthly fee in form of rent and interest that you pay to the municipality over time."

The background story (**narrative structure**) is presented as a short animation to **entertain** and **motivate** the player (Huynh-kim-bang et al., 2010). As explained in the backstory story, the player assigned his/her own general practice in a certain area (**world building**). Thus, a virtual map will be created for the serious game, making **players** responsible for the GP care provided in their designated area. Moreover, the player is able to choose his/her own avatar that represents him/herself in the game (**character**). The background story, world-building and avatar are the first **engagement** tools used in the game.

In the first mini-game the player enters his newly build general practice, which only contains rooms with the provided basic equipment. However, this is not enough to start providing population based healthcare. The first mini-game is described in the next section.

5.2 Mini-game one

This section describes the game design of the first mini-game. The first subsection describes how the player is introduced and what the game objective is. The second subsection describes what decisions the player can make in order to achieve the game objective (**play**). The final subsection describes the feedback the player receives after playing the mini-game. Providing an introduction before the gameplay starts, allows the player to convey information without disturbing him/her (Huynh-kim-bang et al., 2010)

This overall structure aligns with the **time for action / time for thought** design pattern from Huynhkim-bang et al. (2010) which provides a solution for teaching high-level knowledge in a serious game. This is done by using intensive action phases (i.e. **gameplay**) and less intensive phases for thought and reflection (i.e. **feedback**). This is expected to trigger a reflective process in the player.

5.2.1 Introduction

The first mini-game starts with an introduction, which tells a **story** that is a follow up of the **background story**. The story of the first mini-game begins as follows and is described from the player's perspective.

"Welcome to the General Practice Manager. After six months, the general practice has been built and you are now the proud owner of a general practice in the beautiful "**name of area**". All the "**number of patients**" inhabitants in that area have enrolled in your general practice, form your **population** (**object**) and will move to the area in January 2015.

It is September 2014 and you are now four months away from opening your general practice. It is time to start making decisions how you run your general practice as you are the only staff member.

The Ministry of Health, Welfare and Sport has just released a new funding system for GP care, which consists of three segments and you are not familiar with **(dramatic arc)** (Nederlandse ZorgAutoriteit, 2014). The three segment model will be launched in 2015 and each segment has its own focus, which are:

- Segment 1 basic GP care
- Segment 2 multidisciplinary care
- Segment 3 rewarding healthcare outcomes and innovation

The four biggest healthcare insurance companies offer healthcare tasks (services) in each segment that you as a GP can acquire and organize, so that you can serve your population. However, you can only acquire healthcare tasks (services) from the healthcare insurance company that is dominant in your region, i.e. where most of the patients in the region are insured (Expert 2, personal communication, May 27, 2015). You will learn more about these segments throughout the game.

Because you only have three months left before the general practice opens, you have decided to focus on organizing basic GP care for 2015 of segment 1 only. The dominant healthcare insurance company "**name of dominant healthcare insurance company**" in your region has presented their new plans for this segment.

Game objective

You have received medical records of your patients from their previous GPs. However, due to an ICT malfunction only few data are available on your patients and no paper records are available (dramatic arc). Your main game objective is to organize GP care for segment 1 (objective). You can do this by managing staff (procedure); acquiring and organizing (providing) healthcare tasks (services); (procedure) and dividing tasks (procedure)."

The **story** and **game objectives** are displayed in the game as text, so the player should read them carefully. The **name of the area** is displayed, so the player will know which area he/she is responsible for and where the general practice is established (**engagement**). The number of registered patient has been displayed, so the GP knows how many patients he provides care for. This provides more **engagement** and is the first important statistic required to provide population-based healthcare.

After the player has read the story and game objective, the player can start the first mini-game by pressing a button. This starting action initiates the gameplay (**procedure**), which is discussed in the next subsection. An example of how the introduction screen is presented in the game is shown in Figure 5.1.

Background story	Introduction			
Introduction mi	ni-game 1			L General practice
Story Welcome to the General F general practice in the be- and will move to the area It is September 2014 and run your general practice The Ministry of Health, W are not familiar with. The Segment 1 - basic GP care Segment 2 - multidisciplin Segment 3 - Rewarding he	Practice Manager.Afte nutiful Uithof. All the 4 n January 2015. you are now four mon as you are the only sta elfare and Sport has j ihree segment model ary care althcare outcomes ar	r six months, the general practice h I700 inhabitants in that area have e ths away from opening your genera iff member. Just released a new funding system f will be launched in 2015 and each s d innovation	as been built and you are now the proud owner of a norolled in your general practice, form your population al practice. It is time to start making decisions how you for GP care, which consists of three segments and you egment has its own focus, which are:	Welcome team withof Location Uithof Urbanisation Suburban # of patients 4700
The four biggest healthca organize, so that you can s insurance company that is these segments througho Because you only have th 2015 of segment 1 only. T segment.	e Insurance compani erve your population dominant in your reg it the game. ee months left before he dominant healthca	es offer healthcare tasks (services) However, you can only acquire hea ion, i.e. where most of the patients i the general practice opens, you ha re insurance company Achmea in yo	in each segment that you as a GP can acquire and althcare tasks (services) from the healthcare in the region are insured. You will learn more about ve decided to focus on organizing basic GP care for our region has presented their new plans for this	Start new mini-game When you are ready, you can start the next mini-game by clicking the button below!
Game objectives You have received medica However, due to an ICT m and no paper records are- care for segment 1. You ca - Acquiring and organizing - Managing staff; - Dividing tasks.	l records of your patie alfunction only few da available. Your main g In do this by: (providing) healthcar	ents from their previous GPs. ata are available on your patients ame objective is to organize GP e tasks (services);	New game content New game content has been unlocked. You can now start: - View on your population. - Adding staff - Adding tasks - Adding resources	Mini-game 1 is next!

Figure 5.1: Introduction screen

5.2.2 Gameplay

The player enters mini-game one and is asked two questions. First, how many hours he/she wants to work (**procedure**). The player can choose to work between 16 and 60 hours per week (**rule**), which is converted into fulltime-equivalents (FTEs). One FTE of a general practice owner equals to 60,5 hours, which has been rounded off to 60 for the game (**rule**) (Van Hassel, Van der Velden, & Batenburg, 2014).

Secondly, the player is asked how much he/she wants to earn (**procedure**). The player can choose a yearly gross salary between € 18.000 and higher (**rule**), whereas € 18.000 is the minimum wage in the Netherlands (Rijksoverheid, 2015b). As a GP owner, you can decided these things yourself (Expert 2, personal communication, May 27, 2015). How these decisions will affect the game, is explained later on.

After these decisions, the player will enter the main gameplay screen of mini-game one. In this screen, the player will be confronted with a countdown timer of twenty minutes (**resource, conflict**). The player has twenty minutes to perform the procedures described below to achieve the main objective. After these twenty minutes the serious game will automatically submit the decisions made so far (**rule**). The player has much freedom of movement within this screen (**play**), which is elaborated on below.

Procedure 1: Analyzing the needs of the patient population

The first **procedure** that is necessary for the player to achieve the main objective, is to analyze the **patient population (object)**. However as the story describes, the information on the patient population is limited (**rule**). Therefore, only the necessary data on the patient population that is required to provide basic care from segment one is presented to the player. As for population data, the demographics and healthcare characteristics of the Supply, Demand and Analysis Monitor (*Vraag Aanbod Analyse Monitor*, VAAM) are used (NIVEL, 2015b). The goal of the VAAM is to contribute to the discussion on aligning the supply of primary healthcare to the local healthcare demands of an area. The VAAM contains amongst others estimations of the primary healthcare demands for postal codes. For the first mini-game, the player will be presented with population data as presented in Table 5.1.

Name	Description	Туре
Patients	These are the number of patients that are registered to the general practice.	D
Gender	The gender division within the population, i.e. percentage and number of men and women.	D
Age	The age division in categories within the population, i.e. percentage and number of patients between the ages of "0-4", "5-14", "15-24", "25-39", "40-64", "65-74" and "75 and older".	D
Low Income	The percentage and number of patients with a low income.	D
One person households	The percentage and number of patients with a one person household.	D
Non-westerns migrants	The percentage and number of patients that are non-westerns migrants.	D
Perceived health	The percentage and number of patients with a bad to moderate perceived health between the ages of 20-64 years old.	Н
Anxiety or depression	The percentage and number of patients with a high risk on anxiety or depression disorders.	Η

Table 5.1: Population data mini-game one (NIVEL, 2015b).

The type of population data is divided into demographics (D) and health characteristics (H).

Moreover, information on whether the area is **deprived** will be provided. This is important, because a GP receives more income providing care in a deprived area (**rule**) (NZA, 2014). Finally, the player will be presented information on how **urbanized** the area is. This is important, because the housing costs such as rent, gas, water and light are higher in more **urbanized** an area is (**rule**) (Dijkers et al., 2011). Providing this information may influence decisions a player makes for his/her general practice. For example, if most patients in the population are over 65 years old, the player should make different decisions in terms of healthcare tasks and staffing than if most patients are young.

In the serious game, each player will be assigned a different population, so that players can learn how to deal with different populations (**rule**). Moreover, the demographics and healthcare characteristics of the municipality and the Netherlands will be shown, so the player can compare the values with his/her population. In the serious game this data is presented through the virtual GP information system (*Huisarts Informatie Systeem*, HIS). An example of how demographics and health characteristics are presented in the game are shown in Figure 5.2.



Other demographics



The player needs this information to determine which healthcare tasks he/she should acquire from segment one. How these are connected is explained in Section 5.2.3.

Procedure 2: Providing healthcare tasks (services)

After analyzing the patient population, the second **procedure** that is necessary for the player to achieve the **main objective**, is acquiring and organizing **healthcare tasks** (services) (**object**, **procedure**). As presented in the story, the Ministry of Health, Welfare and Sport (Nederlandse ZorgAutoriteit, 2014) has just released a new funding system for GP care, which consists of **three segments** and is presented in Figure 5.3.



Figure 5.3: Three segment model (Nederlandse ZorgAutoriteit, 2014)

In the Netherlands, the four largest healthcare insurance companies offer healthcare tasks that a GP can acquire and organize to service the population². In the first mini-game, the player will be presented the two healthcare tasks from segment one only, which are offered by the dominant healthcare insurance company in the region (**rule**). In the new funding system for GP care, also known as the segment model, each of the four big healthcare insurance companies offer the same two healthcare tasks. These are the basic provision GP care and nurse practitioner mental healthcare (POH-GGZ), which are presented in Table 5.2 (NZA, 2014).

Table 5.2: Healthcare tasks segment one (NZA, 2014	Table	5.2:	Healthcare	tasks	segment	one	(NZA,	2014)
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Name	Description
Basic provision GP care	Providing basic provision GP care, which consists of patients registering to a general practice and the GP offering consults to patients.
Nurse practitioner mental healthcare (POH-GGZ)	Providing basic mental care for your patients.

The two healthcare tasks are offered by each of the four healthcare insurance companies, however **differences** in rewarding, terms and conditions exist. Take for example the "Nurse practitioner mental healthcare (POH-GGZ)" healthcare task in Table 5.3 (*Achmea, 2014; CZ, 2014; Menzis, 2014; VGZ, 2014*).

In the terms and conditions, healthcare insurance company A demand the stimulation of E-health and use of a screening (triage) tool, while this is an optional choice for the other healthcare insurance companies. Moreover, healthcare insurance company C reimburses 0.23 FTE (9 hours) per 2,168 patients, while the others reimburse 0.25 FTE (9 hours) per 2,350 patients. Healthcare insurance companies B and D reimburse 0.33 FTE (12 hours) in case a GP decides to take consultation, E-health and/or a screening (triage) tool, while this is mandatory for Healthcare insurance company A.

² http://www.janstrien.com/thesis/Healthcare_task_four_big_HICs.docx

HIC	Terms and conditions	Reward		
HIC A	Hires POH-GGZ with required	Туре	Hours	€
	diplomas	Availability POH-GGZ	10	€ 2,32
	POH-GGZ has his own office and	Consultation	1	€0,24
	access to GP information system	E-health	1	€0,24
	(HIS)	Total	12	€ 2,80
	 GP has a contract with at least one GGZ care provider for consultation GP stimulates E-health 	Maximum 0.33 FTE (12 h practice (2,350 patients)	ours) per	norm
	GP uses a screening tool			
HIC B	 Hires POH-GGZ with required 	Туре	Hours	€
	diplomas	Availability POH-GGZ	9	€ 2,10
	 POH-GGZ has his own office and 	Consultation *		
	access to HIS	E-health *	3	€ 0,70
	• GP has a contract with at least one	Triage instrument *		
	GGZ care provider for consultation*	Total	12	€ 2,80
	GP stimulates E-health *	Maximum 0.33 FTE (12 hours) per norm		
	GP uses a screening tool *	practice (2,350 patients)		-
HIC C	Hires POH-GGZ with required	Туре	Hours	€
	diplomas	Availability POH-GGZ	9	€ 2,10
	POH-GGZ has his own office and	Consultation *	-	€ 0,35
	access to HIS	E-health *	-	€ 0,35
	• GP has a contract with at least one	Total	9	€ 2,80
	 GGZ care provider for consultation* GP stimulates E-health * 	practice (2,168 patients)	nours) pe	er norm
HIC D	• Hires POH-GGZ with required	Туре	Hours	€
	diplomas	Availability POH-GGZ	9	€ 2,10
	• POH-GGZ has his own office and	Consultation *		
	access to HIS	E-health *	3	€ 0,70
	• GP has a contract with at least one	Triage instrument *		
	GGZ care provider for consultation*	Total	12	€ 2,80
	GP stimulates E-health *	Maximum 0.33 FTE (12 h	ours) per	norm
	 GP uses a screening (triage) tool * 	practice (2,350 patients)		

Table 5.3: Nurse practitioner mental healthcare (POH-GGZ) (Achmea, 2014; CZ, 2014; Menzis, 2014; VGZ, 2014)

HIC = Healthcare Insurance Company, * = optional

Therefore, the **number of players** for the serious game should be at least four. In this way the different demands of the four big healthcare insurance companies can be simulated and compared amongst **players** while playing the game. While analyzing the terms and conditions of the different healthcare tasks, similar **attributes** could be depicted and are shown in Table 5.4. These attributes have been completed with examples from healthcare insurance company A (Achmea, 2014).

Attribute	Description	POH-GGZ				
Name	The name of the task.	Nurse practit	Nurse practitioner mental healthcare (POH-GGZ)			
Segment	The segment the task belongs to.	1	1			
Goal	Goal of the healthcare	The POH-GGZ	The POH-GGZ offers mental health support for the			
	task	general pract	general practice			
Year	The year the task is offered.	2015				
Terms and	The terms and conditions	• GP has a	contract with at least one GGZ ca	re		
conditions	of the task.	provider	for consultation			
		POH-GGZ	has his own office and access to	HIS		
		Hires POI Stimulate	H-GGZ with required diplomas			
		 Stimulate Maximum 	0.33 ETE (12 hours) per norm p	JI ractice		
		(2.350 patients)				
Application	The application deadline	Task can be acquired before the 1st of January, 1st of				
deadline	of the task.	April and 1st of July.				
Contract	The contract duration of	One year				
duration	the task.		-			
Reward	The type of the reward	Registration	Per patient that is registere	d to the		
	nd the money that will rate	rate	GGZ per quarter in the	nie POH-		
	health insurance		€ 2,80			
	companies	Per consult	Per type of consult the POH-GG conducts.	Z		
			Consult type	€		
			Consult regular shorter than	€ 9,04		
			20 minutes			
			Consult regular 20 minutes	€ 18,08		
			Visitation regular shorter than	€ 13.56		
			20 minutes	0 _0,00		
			Visitation regular 20 minutes	€ 22,60		
			and longer			
			Telephonic consult	€ 4,52		
			E-mail consult	€ 4,52		
			Group consult	€ 9,04		

Table 5.4: Healthcare tasks attributes

After players **acquire** these healthcare tasks and agree on the terms and conditions, they also need to be **organized** (Expert 2, personal communication, May 27, 2015). Organizing in the serious game is done by conducting and **assigning actions (procedure, object)**, **managing staff (procedure, object)** and **managing resources (procedure, object)** to meet the terms and conditions. Every healthcare task has its own terms and conditions, thus also required actions, staff and resources. To provide an example, we look back at the healthcare task "*POH-GGZ*" from healthcare insurance company A again. We have identified actions (**A**), staff (**S**) and resources (**R**) that match the terms and conditions.

The first term and condition is that a "*GP hires POH-GGZ with required diplomas*". The first action that we can depict is that the GP should invest time in hiring a POH-GGZ (**A**, **S**), which is both an **action** and a required **staff** member. If a new staff member is hired, the GP would need to **train the POH-GGZ** to get familiar with the general practice (**A**) and create a plan (**A**) how the POH-GGZ should function within the general practice. The second term and condition requires that a "*POH-GGZ has his own office and access to GP information system (HIS)*", which can be translated into creating an office (**A**) and buying the necessary equipment/furniture for the office (**R**).

The third term and condition states that a "*GP* has a contract with at least one GGZ provider for consultation" (A), which we can depict as an **action**. The intention of the fourth term and condition "*GP* stimulates *E*-health" is described a bit vaguely. However, it can be depicted that consulting/contacting the POH-GGZ electronically (e.g. email) is sufficient to stimulate E-health. As we already have an activity to make sure the POH-GGZ has an office including required equipment, we will not provide any separate activity for this. The final term and condition mentions that a "*GP* uses a screening tool" when providing POH-GGZ. Buying the screening tool (A, R) can be translated as an activity to determine the right tool and buying the (actual) determined tool. After buying the tool, staff members involved should be able to learn how to use it (A). The results are presented in Table 5.5.

Terms and conditions	Actions (A), Staff (S) and Resources (R)
GP hires POH-GGZ with required diplomas	Hire POH-GGZ (A) (S)
	Train POH-GGZ (A)
	Create plan for POH-GGZ (A)
POH-GGZ has his own office and access to HIS	Create an office for POH-GGZ (A)
(KIS)	• Buy equipment for office of POH-GGZ (R)
GP has contract with at least one GGZ care	• Create agreement with a GGZ care provider
provider for consultation	for consultation (A)
GP stimulates E-health	-
GP uses a screening tool	• Buy screening tool (A) (R)
	• Learn how to use screening tool (A)

Table 5.5: Translation terms and conditions to actions, staff and resources for POH-GGZ.

In the game, staff can be hired and resources can be bought, which is explained later on. However, actions are different as they take time and require certain skills. A Relevant phenomena in GPM are task- differentiation, delegation and reallocation (Dijkers et al., 2011; Maes, 2011; NHG & LHV, 2012) (**ILO 4**). For example efficient task delegation may reduce the workload and allow the general practice to provide more healthcare tasks (services).

Task differentiation is about dividing tasks within an existing function and concerns learning a specific expertise, such as a doctor's assistant learning spirometry. *Task delegation* is about transferring tasks, powers and responsibilities to another function/position e.g. the GP delegates' tasks to his/her (doctor's) assistant. *Task reallocation* is about the structured redistribution of familiar/specific tasks to another occupations, e.g. the GP moving/delegating tasks to his/her (doctor's) assistant (Dijkers et al., 2011).

In this serious game, this phenomenon is depicted as delegating actions (A) of healthcare tasks to staff members (S). To provide an example, we will refer to the POH-GGZ healthcare tasks of healthcare insurance company A again, by interpreting their activities. As stated earlier, actions require a certain skillset. Take for example the first action "*Hire POH-GGZ*" of the healthcare task "*POH-GGZ*". Within the general practice, not every staff member can conduct this action. Allowing your doctor's assistant

to find a new POH-GGZ would probably not be the best idea, while a GP knows what kind of person he/she is looking for.

This is however different for every action, taking the action "*Create an office for POH-GGZ*" as an example. Again it will take some time to set up this office, however more staff members such as a DA within the general practice could conduct this action as a lower skill level should suffice. Allowing the DA to perform this action is cheaper due to the lower salary and relieves the GP in terms of workload. Dijkers et al. (2011) define two types of skills in a general practice, i.e. medical-technical (**medical**) and managerial (**management**) skills. These medical and management skills will be assigned to staff members in the serious game, so they can perform actions.

Besides skill, performing these actions also cost time. In the GP domain, time is divided into direct patient-related time, indirect patient-related time and non-patient time (Jurling et al., 2012; van den Berg, Nobel, & Post-Wijma, 2012; Van Hassel et al., 2014). Direct patient-related time is defined as time spent on patients through consults, visitations, telephone and/or email. Indirect patient-related time is concerned with time spent on patients without having contact with them, i.e. travelling to patients, meetings about patients, medical and financial administration. Non-patient-related time are management tasks, human resources, training and non-patient related meetings (Van Hassel et al., 2014).

Therefore, the actions have six attributes and are presented in Table 5.6, which is exemplified with the action "*Create an office for POH-GGZ*" from the healthcare task "*POH-GGZ*".

Attribute	Description	POH-GGZ
Name	Name of the action.	Create office for POH-GGZ
Time	The time required for the action in hours.	16
Time type	The type of time (direct patient- related time, indirect patient-related time and non-patient time).	Non-patient-related
Medical skill	The medical skill required for the action.	low
Management skill	The managerial skill required for the action.	low
Assigned to	To which staff member the actions has been assigned to.	GP that owns general practice (player)

Table 5.6: Attributes of an action

Note, that the time, medical and management skills are estimated. Moreover, in the serious game an action will automatically will be assigned to the general practice owner when acquiring a healthcare task, in this case the player (**rule**). The player has the ability to re-assign this to another staff member, if he/she meets the two skill levels (**procedure**).

In mini-game one, only healthcare tasks from segment one can be acquired (**rule**). **Dropping** segment one healthcare tasks can be done in mini-game two, because we would like to emphasize that in a real situation you cannot just add and drop healthcare tasks whenever you want (**rule**). The next subsection describes the **managing staff procedure**, which is necessary to offer the healthcare tasks (**procedure**). An example of how healthcare tasks and actions are presented in the game is shown in Figure 5.4.

Task POH-GGZ

ral information		General information	
	POH-GGZ	Name	Create plan for POH-GGZ
t	1	Management skill level	medium
	2015	Healthcare skill level	high
tion	The POH-GGZ offers mental health support for the general practice	ICT skill level	low
and conditions	Staff	Time	8
	* Hire a qualified POH-GGZ * Create plan for POH-GGZ	Time type	other
	Resources	Assigned to	Jan Strien
	* POH-GGZ has an own office * Buy necessary equipment for POH-GGZ * Buy screening instrument software	Assign to	Choose one ▼ Choose one Jan Strien - GP Henk Schuitema - HIDHA
	* Create agreement with other GGZ care provider for consultation * Implement and learn how to use screening instrument software		Anita de Vries - HIDHA
cation date	Q1, Q2, Q3 and Q4		
act duration start	2015		
act duration end	2016		
rd	€ 2.80 - per registered patient € x.xx - depending on type of consult		
rd type	Consultation rates		

Action Create plan for POH-GGZ

Figure 5.4: Healthcare tasks and actions in our serious game

Procedure 3: Managing staff

As described in the previous procedure, healthcare tasks require **staff** (**object**) members. For the first mini-game, three types of staff members can be hired as they are needed for the **two healthcare tasks** in segment one. The required staff members and related healthcare tasks are presented in Table 5.7.

able 5.7: Staf	f members for	[.] mini-game	one
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Staff member type	Description	Healthcare task
General practitioner in service of another GP (huisarts in dienst van een andere huisarts, HIDHA)	Provides GP care and is an employee of the general practice.	Basic provision GP care
Doctor's assistant (DA)	Assists the GP with performing simple medical procedures; conducting intakes; providing information and advising patients; performing simple organizational and profession-related tasks	Basic provision GP care
Nurse specialist mental healthcare (POH-GGZ)	Provides basic mental healthcare for the general practice	POH-GGZ

Comparable to the previous procedures, **staff** is also an **object** that contains attributes. To provide more player **engagement**, staff members have been given a **name**. The **job title** is necessary to depict

what type of staff member the player is hiring. **Gender** is chosen as an attribute, as it may be important for the patients whether they are being treated by a male or a female healthcare professional (Dijkers et al., 2011). The **age** and **experience** are chosen, because they may have an influence on the performance. Expert 2 (personal communication, July 22, 2015) states that an experienced DA is much more valuable than an inexperienced, because they know the patients and can perform more medical and management activities in a shorter timeframe. In the serious game, experience is divided into junior, medior and senior. Like the gender, the **nationality** may be important for patients from a cultural point of view. Moreover, it may increase performance in specific areas/situations where Dutch is not the native language (Dijkers et al., 2011).

The **hours** and FTE that the staff members work can be important, as studies have been conducted on time expenditure that depict how many hours GPs and HIDHA work for a specified number of patients (Jurling et al., 2012; van den Berg et al., 2012; Van Hassel et al., 2014). The studies also show how the hours have been on average divided into **direct patient-related time**, **indirect patient-related time** and **non-patient related time**. These are related to the actions attributes mentioned in the previous procedure. Therefore, standard values for these times have been derived from these studies and has been used for the serious game.

Unfortunately no detailed time expenditure studies are available for DAs and POH-GGZs. For the DAs, a study on patient-related time has been conducted, but shows no time expenditure on non-patient related time (Noordman, Verheij, & Verhaak, 2009). The study shows that most activities the DA performs are indirect patient-related, while a third of those hours are spend on direct patient-related time. Therefore, an estimation has been made that the average DA spends twenty percent on direct patient-related time, sixty percent on indirect patient-related time and another twenty percent on non-patient related time on a full-time basis (**evaluation**).

For the POH-GGZ, we have used the twelve hours that are reimbursed by the healthcare insurance companies as stated in Table 5.3. Furthermore, we have combined these with the percentage of time spent on time expenditure by the HIDHA, as POH-GGZs are hired to spend as much patient-related time as possible. These hours are recalculated if actions from healthcare tasks are assigned to other staff members. The standard values are shown in Table 5.8 and are based on 2,350 patients.

Staff member type	Total	Direct patient- related time	Indirect patient- related time	Non-patient related time	Study
General practice in service of another GP (HIDHA)	60.6 (100%)	37.7 (62.2%)	11.0 (18.1%)	11.9 (19.7%)	van den Berg et al. (2012)
Doctor's assistant (DA)	36 (100%)	7 (20%)	22 (60%)	7 (20%)	Noordman et al. (2009)
Nurse specialist mental healthcare (POH-GGZ)	12 (100%)	7.5 (62.2%)	2.2 (18.1%)	2.3 (17%)	Achmea (2014)

Table 5.8: Standard values time expenditure per 2,350 patients in hours.

As an employee a general practice, staff members receive a **salary** based on their age and experience. These salaries are determined by a collective employment agreement (LHV, 2014). The **specialization** of the staff members may be important as it may align with certain needs within the **population**, e.g. many elderlies (demographics) in the population may require a GP who is specialized in this.
Attribute	Description
Name	The name of the staff member.
Job title	The job title (type/position) of the staff member.
Gender	The gender of the staff member.
Age	The age of the staff member.
Experience	The experience of the staff member.
Nationality	The nationality of the staff member.
Hours (FTE)	The number of hours and FTE the staff member works at the general practice.
Direct patient-	How much direct patient-related time the staff member spends
related time	of his available hours.
Indirect patient-	How much direct patient-related time the staff member spends
related time	of his available hours.
Non-patient	How much non-patient related time the staff member spends of
related time	his available hours.
Salary	The salary of the staff member
Specialization	The specialization of the staff member.
Medical skill	The medical skill level of the staff member.
Management skill	The managerial skill level of the staff member.
Preference	If the staff members prefers to perform medical or managerial activities.

Table 5.9: Attributes of a staff member

Moreover, the healthcare tasks require a certain level of **medical** and **management** skills, thus have been assigned as an attribute to staff members. The values of the skills will be determined by the educational level of the staff member. A GP has the highest level of education, thus has a high-level in medical and management skills (**rule**) (SBOH, 2015). The POH-GGZ has a medium level of education (Landelijke Vereniging POH-GGZ, 2015) and the DA the lowest (NVDA, 2015) (**rule**). The final attribute depicts whether the staff members prefer to perform medical or managerial activities, which is related to employee satisfaction and is explained later. The staff attributes are shown in Table 5.9.

In mini-game one, staff members can only be hired and are contracted for one year (**rule**). Multiple staff members will be available in the job market screen, each having different values for the attributes. Staff members hired in mini-game one can only be **fired** in mini-game two, because they have a one year contract (**rule**). With this rule, we would like to emphasize that in a real situation you cannot just fire staff whenever you want (**rule**). Once a staff member is hired by a player, he/she will be assigned to the general practice and the vacancy will disappear from the **job market screen** (**rule, conflict**). This depicts the scarcity of available healthcare professionals, which is often the case in the real world and especially applies for DAs (Expert 2, personal communication, July 22, 2015). An example of how a staff members is presented in the serious game is shown in Figure 5.5.

Jan Strien

General information		Time division
Name	Jan Strien	Direct patient contact (37)
Job title	GP	37
Gender	male	Indirect patient contact (11) 11
Age	35	Other(11)
Experience	junior	11
Nationality	Dutch	
FTE	1.00	
Salary per year	€ 100,000	
Specialisation	none	

Figure 5.5: Example of staff member in our serious game

Procedure 4: Managing resources

As described in the previous procedure, healthcare tasks require **resources** (**object**). For the first minigame, the player can buy resources that are needed for the two healthcare tasks in segment one. The required resources and related healthcare tasks are presented in Table 5.10.

Table 5.10: Resources

Type of resources	Description	Healthcare task
HIS system	Information system for the GP to register patient information	Basic provision GP care
HIS license	Licenses required for the HIS. Each staff member requires a license	Basic provision GP care
POH-GGZ office equipment	POH-GGZ equipment required to install the office.	POH-GGZ
POH-GGZ screening tool	POH-GGZ screening tool required to use while performing consults.	POH-GGZ

Like the previous procedures, **resources** are also an **object** that contains attributes. The attributes of the resources are presented in Table 5.11. The resource attributes are based on logic.

Table 5.11: Attributes of resources

Attribute	Description
Name	The name of the resource.
Description	Description of the resource, depicting what it does.
Туре	The type of resource, e.g. software, furniture etc.
Price	The price to acquire the resource.

In mini-game one, the player can only buy resources (**rule**). **Selling** resources can be done in mini-game two, because we want the player to make informed decisions (**rule**).

Procedure 5: observing other players

Another procedure players can perform, is observing what **objects** other players are acquiring without seeing too much details (**procedure, rule**). For this procedure, the virtual map described in the background story will be used (**world building**). On this virtual map, players can see where they and other players are located. The player can click on the area to see the **tasks**, **staff** and **resources** other players acquired. This procedure is intended to misguide other players, as they might try to copy each other while having a different **population** that requires different decisions. The gameplay screen and virtual map of the game is presented in Figure 5.6.

GPM GENERAL PRACTICE MANAGER	
Introduction General practice HIS - Market - YMap	
Map of area including other ger Map of area including other ger Resource shop	
Information The map shows the location of your and other general practices in the area. Click on the area to see its information.	Welcome team uithof
Uithof Amazonedreef	LocationUithofUrbanisationSuburban# of patients4700
	O Mini-game level info
	Mini-game 1 Time remaining 0 hr 13 min 2 sec
Vleuterwijde	

Figure 5.6: Gameplay screen including virtual map in our serious game

Procedure 6: submitting decisions

After twenty minutes the countdown timer stops or the player submits his/her results earlier than that by pressing a button. Then the player proceeds to the feedback screen, which is described in the next subsection.

5.2.3 Feedback

Fullerton (2008) states that **outcomes** of a game should be unpredictable so that the player will stay engaged (**outcome**). Therefore, players will receive feedback on their decisions (**ILO 8**) after submitting their results rather than providing them with real-time feedback during the game. In mini-game one, the player will receive feedback on decisions that were made regarding the game objective, which is organizing GP care for segment one that aligns with the population.

The player will receive qualitative and quantitative feedback, based on the **KPIs** mentioned by expert 1 (personal communication, April 16, 2015). The KPIs depict categories, which are important to keep in mind when performing GPM and are presented in Table 5.12. For each KPI category, specific KPIs will be defined that are measurable and related to decisions the player makes.

KPI	Description
Reducing the cost per capita	Reducing the costs for the general practice, patients and government. For example, how healthcare tasks (services) provided by the general practice contribute to reducing the costs on a macro-level.
Improving the health of the population	Matching supply and demand by aligning healthcare tasks (services) and staff members with the needs of the patient population.
Patient satisfaction	How patients perceive care and services of the general practice.
Employee satisfaction	How employees perceive working at the general practice.
Financial health	Keeping the general practice financial healthy, i.e. having more income than expenses.

Table 5.12: KPIs for the serious game expert 1 (personal communication, April 16, 2015)

How the decisions of the player influence these **KPIs** is explained below, which is again exemplified using the healthcare task "*POH-GGZ*". As described, the player will be provided with qualitative feedback, which will depict how it would affect the real-world (**outcome**). Moreover, quantitative feedback will be provided that is based on the qualitative feedback and depicts in numbers how well the general practice is doing (**outcome**). Players can receive a quantitative score for each KPI between zero and ten (**rule**). In mini-game one, players have an average score of five that will be affected by the choices the player makes (**rule**). How the score is affected is shown in Table 5.13.

Table 5.13: Quantitative score values

Score	Description
-1	Player made a decision that has a strong negative impact on the KPI.
-0.5	Player made a decision that has a negative impact on the KPI.
-0.25	Player made a decision that has a mildly negative impact on the KPI.
0	Player made a decision that does not impact on the KPI.
+0.25	Player made a decision that has a mildly positive impact on the KPI.
+0.5	Player made a decision that has a positive impact on the KPI.
+1	Player made a decision that has a very positive impact on the KPI.

Keep in mind that the qualitative and quantitative outcomes are different for **every decision** the player makes in the serious game (**rule**).

KPI 1: Reducing the cost per capita

This KPI category deals with reducing the costs for the general practice, patients and government. For example, how healthcare tasks (services) provided by the general practice contribute to reducing the costs on a macro-level. If a general practice owner would acquire the POH-GGZ healthcare task for his/her general practice, it will **reduce the cost per capita**. The reason is that patients that have mild and easy to deal with psychological problems can now be treated within the general practice (primary care), instead of being referred by the GP to a mental care specialist (secondary care). Providing

primary care to patients is much cheaper than providing secondary care. This is the case for healthcare insurers, the government and patients (Mijn Gezondheidsgids, 2014). In 2014 twenty to thirty percent of the patients with mild and easy to deal with psychological problems were wrongfully referred to secondary care specialists, mostly because of insufficient supply of primary care.

In the serious game, the player receives qualitative and quantitative feedback on **reducing the cost per capita** as shown in Table 5.14.

Table 5.14: Example of qualitative and quantitative feedback on	"reduce the cost per capita" for the POH-GGZ healthcare
task	

Acquired?	Qualitative	Quantitative
Yes	Good job! Providing the POH-GGZ healthcare task within the general practice will reduce the cost per capita, because providing primary care to patients is much cheaper than providing secondary care for healthcare insurers, the government and patients.	+0.5
No	You should consider providing the POH-GGZ healthcare task within the general practice because it will reduce the cost per capita. Providing primary care to patients is much cheaper than providing secondary care for healthcare insurers, the government and patients.	-0.5

KPI 2: Improving the health of the population (alignment)

It is debatable that acquiring the POH-GGZ healthcare task will improve the health of the population, as no definite outcomes can be defined. However, we can determine if the decisions the player makes align with the needs of the population. For example, we can determine if the acquired healthcare task such as "POH-GGZ" aligns with the needs of the patient population, i.e. population-based healthcare. Therefore, we will compare the "percentage and number of patients with a high risk on anxiety or depression disorders" healthcare characteristic value defined in Table 5.1 of the player's area with that of the municipality. If the percentage of the player's area is higher than that of the municipality he should have acquired it (rule). If the percentage of the player's area is lower than that of the municipality, the player will receive feedback that the value is lower but he should still consider it (rule).

Another example is to determine whether the staff that is hired by the player aligns with the population. We can compare for example the "percentage and number of patients that are nonwesterns migrants" healthcare characteristic value defined in Table 5.1 of the player's area with that of the municipality. If the percentage of the player's area is higher than that of the municipality, it may be wise to hire a staff member with the same nationality than that of the non-westerns migrants. The same applies for the percentage of elderly that are 65 years and older, where it may be wise to hire a GP that is specialized in elderly care. However, this will have to be **evaluated**.

In the serious game, the player receives qualitative and quantitative feedback on alignment as shown in Table 5.15.

Acquired?	Value higher?	Qualitative	Quantitative
Yes	Yes	Good job that you have acquired the POH-GGZ healthcare task! The reason is that the percentage and number of patients with a high risk on anxiety or depression disorders in your area is higher than that of the municipality. Therefore, you provide healthcare to the needs of your patient population.	+0.5
Yes	No	You have acquired the POH-GGZ healthcare task. The percentage and number of patients with a high risk on anxiety or depression disorders in your area is lower than the municipality. However, acquiring this task still allows you to provide basic mental healthcare closer to home for your patients.	+0.25
No	Yes	You should consider acquiring the POH-GGZ healthcare task. The percentage and number of patients with a high risk on anxiety or depression disorders in your area is higher than that of the municipality. In this way, you do not provide healthcare to the needs of your patient population.	-0.5
No	No	The percentage and number of patients with a high risk on anxiety or depression disorders in your area is lower than the municipality. However, you should still consider acquiring this task as it allows you to provide basic mental healthcare closer to home for your patients.	0

Table 5.15: Example of qualitative and quantitative feedback on "alignment" for the POH-GGZ healthcare task

An example of how feedback for healthcare alignment is presented in the serious game is shown in Figure 5.7.

Healthcare alignment	Tip!			
POH-GGZ alignment	Good job that you have acquired the POH-GGZ healthcare task! The reason is that the percentage and number of patients with a high risk on anxiety or depression disorders in your area is higher than that of the municipality. Therefore, you provide healthcare to the needs of your patient population.	+0.5	Alignment score	٢

Figure 5.7: Healthcare alignment feedback in our serious game

KPI 3: Patient satisfaction

This KPI category depicts how patients perceive care and services of the general practice. For example, in our serious game we can determine the **patient satisfaction** depending on two factors, i.e. if the hired staff members work sufficient **total** and **direct patient-related hours** to provide the acquired healthcare tasks. In the real-world, we can imagine that if staff members of a general practice do not work sufficient hours, **wait times** for consults will increase and patient satisfaction will decrease.

The first factor is that there should be sufficient **hours available in total** of a certain type of staff member to perform a certain healthcare task, e.g. enough FTE of POH-GGZs available to provide the POH-GGZ healthcare task. To determine this for the general practice owner and his/her HIDHAs for the healthcare task *"basic provision GP care"*, the study by van den Berg et al. (2012) on time expenditure within the general practice is used. The study states that general practice owners and their HIDHAs

need to work 60.6 hours per week on average to serve 2,350 patients, which is considered one FTE and excludes evening, night and weekend shifts (ANW) outside the general practice (**rule**). For this decision, the hours the player determined for him/herself and the hours of the HIDHAs he/she hired are accumulated.

Another study by van den Berg et al. (2012) on time expenditure reveals that general practice owners hire 46.4 hours (1.22 FTE) of DA hours per 2,350 patients on average to let the general practice function smoothly (**rule**). Only 36 hours (1 FTE) will be reimbursed by the healthcare insurances companies, thus the player will have to pay the remaining (**rule**). As shown in Table 5.3, most healthcare insurance companies only reimburse 12 hours (0.33 FTE) of POH-GGZ per 2,350 patients. The Dutch Healthcare Authority (NZA) calculated that these 12 hours should be sufficient to serve 2,350 patients, but no study exists to validate these findings. Therefore, in the serious game the player should hire a POH-GGZ for at least 12 hours per 2,350 patients (**rule**). The results are presented in Table 5.16.

Staff member	Ratio	Healthcare task
General practice	60.6 hours (1 FTE) required per 2,350	Basic provision
HIDHAs	patients	Greate
DA	46.4 hours (1.22 FTE) required per 2,350	Basic provision
	patients, but only 1 FTE is reimbursed	GP care
POH-GGZ	12 hours (0.33 FTE) reimbursed per 2,350	POH-GGZ
	patients	

Table 5.16: FTEs and hours per type of staff member per 2,350 patients

In the serious game, these ratios does not have to be met exactly as this may frustrate the player. Therefore, a range around the value has been defined that allows the player to deviate. Furthermore, the hours have been rounded off. Unfortunately no studies exist what an acceptable range would be to maintain a smoothly running performance. Therefore, we have applied a range of minus ten percent (-10%) and plus ten percent (-10%), which will have to be evaluated (**evaluation**). For example, if a player has a population of 2,350 patients he/she should have hired DA capacity that sum up to 46 hours. The player will receive positive, if he/she has hired between 41 hours (-10%) and 51 hours (+10%). If the player has hired DA capacity for less than the 41 hours, the player will receive a penalty on patient satisfaction. If the player has hired DA capacity for more than 51 hours, the player will receive a message that he/she has hired superfluous. The results are shown in Table 5.17.

Table 5.17: Feedback on availability of staff in hours per 2,350 patients

Staff member	Total	Insufficient	Sufficient	Superfluous
General practice owner and HIDHAs	61 hours	Below 55 hours	Between 55 and 67 hours	More than 67 hours
DA	46 hours	Below 41 hours	Between 41 and 51 hours	More than 51 hours
POH-GGZ	12 hours	Below 11 hours	Between 11 and 13 hours	More than 13 hours

The second factor is that staff members should have enough **direct patient-related time** available, which is influenced by assigning actions from acquired healthcare tasks. Again no studies exist on how much **direct patient-related time** needs to be available to maintain a smooth functioning performance.

However, it is obvious that patients become **dissatisfied** if not enough **direct patient-related time** is available when waiting cues will increase. Thus, another range of -20% and +20% has been applied and will have to be evaluated (**evaluation**). The values from Table 5.8 have been used and rounded off to improve the game experience. How decisions regarding the staff availability in hours, influence patient satisfaction is presented in **Appendix D**. The results are presented in Table 5.18.

Staff member	Total	Insufficient	Sufficient	Superfluous
General practice owner and HIDHAs	38 hours	Below 30 hours	Between 30 and 46 hours	More than 46 hours
DA	7 hours	Below 6 hours	Between 6 and 8 hours	More than 8 hours
POH-GGZ	7 hours	Below 6 hours	Between 6 and 8 hours	More than 8 hours

Table 5.18: Feedback ranges of direct patient-related time per 2,350 patients

In the serious game, the player receives qualitative and quantitative feedback on patient satisfaction as shown in Table 5.19. Moreover, the players will receive **guidelines** to determine the right ratios.

Overall hours	Direct hours	Qualitative	Quanti tative
Insufficient	-	Your POH-GGZs do not work enough hours to provide enough mental healthcare for your patient population.	-1.0
Sufficient	Insufficient	Your POH-GGZs work enough hours to provide mental healthcare to your population. However not enough time is spent on direct patient-related time. Therefore, your patients have to wait longer for the services.	-0.5
Sufficient	Sufficient	Your POH-GGZs work enough patient-related hours to provide mental healthcare to your population.	+0.5
Sufficient	Superfluous	Your POH-GGZs work more than enough hours to provide mental healthcare to your population. However, as a result too much time is spent on direct patient-related time.	+0.25
Superfluous	Insufficient	Your POH-GGZs work way too many hours to provide mental healthcare to your population. However, not enough time is spent on direct patient-related time. Therefore, your patients have to wait longer for the services.	-0.5
Superfluous	Sufficient	Your POH-GGZs work way too many hours to provide mental healthcare to your population. However, they offer sufficient patient-related time.	+0.25
Superfluous	Superfluous	Your POH-GGZs work way too many hours to provide mental healthcare to your population. This should be lowered.	0

An example of how feedback for patient satisfaction alignment is presented in the serious game is shown in Figure 5.8.

	Тір	TASK: THE REASON IS THAT	n anxiety or depression disorders			
	2350 patients r POH-GGZ FTE	require at least 0.33 E.	ealthcare to the needs of your			
Staff		Tip!				
POH- balan	·GGZ / patient ce	0.25 POH-GGZ FTE(s) fo Your POH-GGZs do not enough mental healthca	or 4700 patients work enough hours to provide re for your patient population.	-1	Patient satisfaction	3

Figure 5.8: Patient satisfaction feedback in our serious game

KPI 4: Employee satisfaction

This KPI category depicts how employees perceive working at the general practice. For example, **employee satisfaction** can be related to the **actions** that are **assigned** to staff members (**procedure**). It is being determined by the direct patient-related time, indirect patient-related time and non-patient time division for the staff member. As described, staff members are assigned an attribute that depicts whether they prefer to conduct medical or management activities. After actions from healthcare tasks have been assigned to staff members, the serious game will recalculate the time and determine the satisfaction. For example, a HIDHA prefers to conduct medical activities but has been assigned to so many management actions from different healthcare tasks that his non-patient-related time is greater than his direct patient-related time.

Therefore, the HIDHA will be dissatisfied and the player will be given a penalty with respect to **employee satisfaction**. This is a prominent example of what has been happening in the GP domain, healthcare insurance companies demanding a lot of non-patient (**actions**) for their healthcare tasks such as administration. This causes GPs to have less patient-related time, which frustrates many GPs (Volkskrant, 2015).

How the direct patient-related, indirect patient-related and non-patient-related time are computed is shown in Table 5.20. It uses the example of a DA that has been assigned several actions.

Step	Description	Example
1	The original hours of the DA are depicted on a weekly basis.	Direct patient-related 8 Indirect patient-related 24 Non-patient time 8 Sum = 40
2	The game sums up the number of total, direct patient-related, indirect patient-related and non-patient-related hours of actions that are assigned to the DA	Sum of assigned direct patient-related 0 hours Sum of assigned indirect patient-related 0 hours Sum of assigned non-patient related time 94 hours
3	The hours are divided by 47 weeks, so that the hours are spread amongst the year. There are 52 weeks in a year minus the average vacations weeks are 5 in the Netherlands.	Direct 0 / 47 = 0 hours Indirect 0 / 47 = 0 hours Non-patient 94 / 47 = 2 hours
4	The original hours from step 1 of the DA are now added up with the new divided hours from step 3. Finally, the numbers are added up.	Direct 8 + 0 = 8 hours Indirect 24 + 0 = 24 hours Mon-patient 8 / 2 = 10 hours Sum = 42 hours
5	The direct, indirect and non-patient related hours from are divided by the sum of step 4 to calculate the new percentage of hours.	Direct 8 / 42= 19,1 % Indirect 24 / 42= 57,1 % Mon-patient 10 / 42 = 23,8 %
6	Finally the sum from step 1 is multiplied with the percentages of step 5 to determine how the hours are divided after assigning actions.	Direct 40 * 19,1 % = 7,64 hours Indirect 40 * 57,1 % = 22.84 hours Non-patient 40 * 23,8 % = 9.52 hours

Table 5.20: Computing of direct patient-related, indirect patient-related and non-patient-related time

After this process, new values for the direct patient-related, indirect patient-related and non-patient-related hours have been calculated. For example the DA now spends 9 non-patient-related hours instead of 8, when rounding off the numbers.

In the serious game, the player receives qualitative and quantitative feedback on employee satisfaction as shown in Table 5.21.

ruble 5.21. Example of quantative and quantitative recuback on employee satisfaction for ron 662 nearlifeare task

Preference?	Most hours?	Qualitative	Quantitative
Medical	Non-patient	Your staff member is unsatisfied as he/she prefers to conduct medical activities, but most of his/her time is assigned to managerial activities.	-0.5
Medical	Patient related	Your staff member is satisfied as he/she prefers to conduct medical activities, which is the case.	+0.5
Manager	Non-patient	Your staff member is satisfied as he/she prefers to conduct managerial activities, which is the case.	+0.5
Manager	Patient related	Your staff member is unsatisfied as he/she prefers to conduct managerial activities, but most of his/her time is assigned to medical activities.	-0.5

Another example is to measure the **working load** of an employee, which is related to the hours a certain type of staff member (employee), in this case the POH-GGZ should work. This can be done by using the data from Table 5.17 and Table 5.18. In the real-world, we can imagine that if staff members of a general practice do not work sufficient hours, working pressure will increase and employee satisfaction will decrease.

KPI 5: Financial health

This KPI shows how financial healthy the general practice is, which is related to the **balance between the income and expenses** of the general practice. This allows the player to understand how finances are managed in a general practice (**ILO 6**). Income is generated by providing healthcare tasks for the population as described earlier, which is being compensated by the healthcare insurance companies. As an example, we have used the POH-GGZ healthcare task again, including the 2,350 patients norm.

As shown in Table 5.4, compensations (rewards) are reimbursed through a registration rate and per consult. We will determine the average number of consults a POH-GGZ conducts per 1,000 patients, using the study by Magnée, de Beurs, & Verhaak (2015). The study reveals how many consults a POH-GGZ conducts for each of the consult types on average per year per 1,000 patients. This allows us the compute the data in Table 5.22.

Type of consult	costs per consult	# of consults per 1,000 patients	Income POH-GGZ from consults
Consult regular shorter than 20 minutes	€ 9,04	3	€ 27,12
Consult regular 20 minutes and longer	€ 18,08	102	€ 1.844,16
Visitation regular shorter than 20			
minutes	€ 13,56	0	€ 0,00
Visitation regular 20 minutes and			
longer	€ 22,60	4	€ 90,40
Telephonic consult	€ 4,52	12	€ 54,24
E-mail consult	€ 4,52	0	€ 0,00
Group consult	€ 4,52	0	€ 0,00
Total		121	€ 2.016

Table 5.22: Formula average POH-GGZ consults per 1,000 patients in 2014 (Magnée et al., 2015)

The calculations allows us to determine that a POH-GGZ generates \in 2.016 on average per 1,000 patients per year. Therefore, the formula for the income generated by consults is: " \in 2.016 divided by 1,000 patients times the amount of patients that have been registered at the general practice". The formula for the registration rate per year is: "registration rate per patient per quarter times the number of patients that have been registered to the general practice times four quarters". The formulas are shown in Table 5.23.

Table 5.23: Income formula for the POH-GGZ

Name	Formula	Calculation
Registration	Registration rate per patient per quarter * # patients	€ 2.80 * 2350 * 4 =
rate	of player's general practice * four quarters	€ 26.320
Consult	(Average amount of income generated by a POH-GGZ	(€ 2.016 / 1000) *
	per 1,000 patients per year / 1,000 patients) * #	2350 = € 4.737
	patients of player's general practice	
Total		€ 31.057

The expenses of the POH-GGZ are based on the required staff and resources of the healthcare task. As presented in Table 5.5, the player is required to hire a POH-GGZ, buy a screening tool and buy equipment for the office. Table 5.24 shows an example of the expenses of the POH-GGZ healthcare task.

Туре	Description	Example
Staff	Salary of the POH-GGZ a year (12 hours a week)	€ 23.100
Resource	Price of the screening tool	€1.000
Resource	Price of the equipment for the POH-GGZ office	€ 3.000
Total		€ 27.100

In the serious game, the player will be **penalized** if he/she does not hire the required type of staff member (POH-GGZ) for the sufficient number of hours. To determine this, the data from Table 5.17 and Table 5.18 is used once again. Moreover, if the player does not buy the required resources he/she will be penalized. These decisions will impact the number of consults the player performs in the serious game and thus will have financial impact. In the real-world, we can imagine that not hiring the required type of staff member (POH-GGZ) for the sufficient number of hours will have a greater impact than not

buying the required resources. Moreover, we believe that having insufficient hours available for a certain healthcare tasks will have a greater negative impact on the performed consults than having superfluous hours available.

For example, having insufficient hours available will quickly increase the wait times for patients and will allow players to perform a lot less consults. Having superfluous hours available will not necessarily make more patients come to the general practice, thus the player will probably not perform a lot more consults. However, this does impact the expenses of the general practice as more salary has to be paid to the staff members that work superfluous hours. This algorithm is based on logic and will be **evaluated** by experts. Therefore, this feedback will be divided into staff and resources. How decisions regarding the staff availability in hours, influence the financial health is presented in **Appendix D**. Table 5.25 shows the qualitative and quantitative feedback for the staff.

Staff	Hours?	Qualitative	Consults
Yes	Insufficient	You have hired the required staff member(s), but they do not work sufficient hours for the provided healthcare task (service).	30% less income generated from consults for the provided healthcare task (service).
Yes	Sufficient	You have hired the required staff member(s), which work sufficient hours for the provided healthcare task (service).	Normal income generated from consults for the provided healthcare task (service), decision has no impact on consults
Yes	Superfluous	You have hired the required staff member(s), which work superfluous hours for the provided healthcare task (service).	5% more income generated from consults for the provided healthcare task (service).
No	-		No income generated from consults

 Table 5.25: Example of qualitative and quantitative feedback on "required staff and impact on consults" for the POH-GGZ

 healthcare task

Table 5.26 shows the qualitative and quantitative feedback for the required resources.

 Table 5.26: Example of qualitative and quantitative feedback on "required resources and impact on consults" for the

 POH-GGZ healthcare task

Resources bought?	Qualitative	Consults
Yes	You have bought the required resources.	Normal income generated from consults for the provided healthcare task (service), decision has no impact on consults
No	You have not bought the required resources.	2% less income generated from consults for the provided healthcare task (service).

We think it is also important to determine the costs for the "basic provision GP care" healthcare task as every general practice provides this and gives a good overview of expenses of the general practice. A study revealed the average expenses of a general practice **providing basic GP care** per 2.168 patients (NZA, 2015). This was previously 2,350 patients, but the NZA has lowered the standards since 2014. However, most studies and healthcare insurance companies still use the 2,350 patient norm. Therefore, we have maintained this norm in the serious game.

The expenses are divided into two categories, i.e. salary and expenses for the general practice owner and costs of the general practice itself. The general practice costs are divided into staff, treatment, housing, ICT, transport, general and interest costs. The summary of these costs are presented in Table 5.27.

Expense category	Type of expense	€	Percentage
General practice owner	Expenses and	€ 126.740	41%
(€ 126.740)	salary general		
	practice owner		
Other general practice	Other staff costs	€ 66.229	36%
costs	Treatment	€ 3.679	2%
(€ 183.970)	Housing	€ 12.878	7%
	ICT	€ 3.679	2%
	Transport	€ 1.840	1%
	General	€ 16.557	9%
	Interest	€ 3.679	2%
Total		€ 310.710	100%

Table 5.27: Average expenses of a general practice conducting "basic GP care" per 2,168 patients (NZA, 2015)

In the serious game the GP can choose his/her own salary. Therefore, the labor costs will be related to that decision (**procedure**). Players can hire and fire staff themselves, thus the staff costs are related to those decisions (**procedure**). The treatment, housing, ICT, transport, general and interest costs are not presented in the game yet. Therefore, they will be calculated automatically and are dependent on number of registered patients the general practice has. Take for example the housing costs in Table 5.27, which is based on 2,168 patients. If a player has 2,350 patients in the serious game, the formula in Table 5.28 will be applied for calculating the housing costs.

Table 5.28: Formula	housing costs
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Formula	Example
Housing costs = (Average housing costs / # patients in norm practice) * # patients of playor's general	Housing costs = (€ 12.878 / 2168 patients) *
practice	2550

The same formula will be applied for the treatment, ICT, transport, general and interest costs. In the serious game the player can see the income and expenses for the general practice for every acquired healthcare task. Moreover, the player receives qualitative and quantitative feedback on financial health as shown in Table 5.29.

Formula	Qualitative	Quantitative
Income 20% higher than expenses	Your general practice has 20% more income than expenses, meaning you still have enough surplus cash left for investments. Good job!	+1
Income higher than expenses	Your general practice has more income than expenses, Good job! However you have not much surplus cash left.	+0.5
Expenses higher than Income	Your general practice creates has expenses than income. Take a look at the finances.	-1

Table 5.29: Example of qualitative and quantitative feedback on (overall) "financial health"

The income and expenses of the general practice that are presented in the game are shown in Figure 5.9. This is shown in an overview, per segment and resources to provide players with detailed information on how income and expenses are generated for the general practice.

Overview	Segment 1: Basic care	Segment 2: integrated car	re Segment 3: achievements and innovation		Resources
Income			Expenses		
Name		€	Name	Description	£
Income segm	nent 1	269,406	Salaries		
Income segm	nent 2	0	Jan Strien	Salary for your GP	100,000
Income segm	nent 3	0	DA6	Salary for your DA	50,000
Total		269,406	Treatment		2,238
			Housing		16,637
			ICT		4,382
			Transport		3,849
			General		26,415
			Interest		950
			Resources		5,000
			Total		209,471

Figure 5.9: Income and expenses in our serious game

By offering these **advanced indicators**, we hope to enrich and enlarge their vision of the GP domain (Huynh-kim-bang et al., 2010). After the player has read the feedback of mini-game one, he/she can continue with mini-game two.

5.3 Mini-game two

This section describes the game design for the second mini-game and follows the same structure of mini-game in terms of introduction, gameplay and feedback. The player will be confronted with a new **story** and changes in the **gameplay**, which is described below.

5.3.1 Introduction

The introduction of the second mini-game tells a **story** that is a follow up on the **story of the first mini-game**. The **story** of the second mini-game begins as follows and is described from the player's perspective.

"Congratulations, you have been running your general practice for over a year. In 2015 you have been focusing on providing basic GP care from segment one only. During this year, you have gotten to known your patients better and have gathered more information on their healthcare needs.

Because of this you have decided to expand your healthcare services. In 2016 you will focus on segment two in addition to segment one. Segment two is concerned with multidisciplinary care such as integrated care for patients with chronic diseases.

Game objective

Your main game objective is to organize multidisciplinary care for segment 2, while maintaining basic GP care from segment one. This mini-game allows you to revise the decisions made in mini-game one. (objective)."

The introduction screen looks similar to that of the first min-game. The player can start the second mini-game by pressing a button, which is described in the next subsection.

5.3.2 Gameplay

The player will now enter the main gameplay screen of mini-game two, where the player will be confronted with a countdown timer of twenty minutes once again (**resource, conflict**). In the gameplay of mini-game two, there are some minor changes compared to the first mini-game and are related to the procedures. Mini-game two becomes more difficult as more profound decisions will have to be made, while the outcomes from mini-game one serve as the starting point.

Procedure 1: Analyzing the needs of the patient population

As described in the **story**, the player gathered more data on the healthcare needs of the patient population. This is an addition to what was provided in mini-game one and is presented in Table 5.30.

Name	Description
At least 1 chronic	The percentage and number of patients with at least one chronic
condition	condition.
At least 2 chronic	The percentage and number of patients with at least two chronic
conditions	condition.
Diabetic	The percentage and number of diabetic patients.
High blood	The percentage and number of patients with a high blood pressure.
pressure	
Asthma / COPD	The percentage and number of patients that have Asthma and COPD.

Table 5.30: Population data mini-game two (NIVEL, 2015b).

The health characteristics that are presented in the game are shown in Figure 5.10. The player needs this information to determine which new healthcare tasks he/she should acquire from segment two, is described in Section 5.3.3.





Figure 5.10: Chronic diseases health characteristics in our serious game

Procedure 2: Acquiring and organizing healthcare tasks (services)

POH-S

Integrated care DM2

After analyzing the new data for the **population**, the second **procedure** is acquiring and organizing healthcare tasks for segment two. In the second mini-game, the player will be presented with four new healthcare tasks from segment two that are offered by the dominant healthcare insurance company in the region (rule). Such as in mini-game one, differences in rewarding, terms and conditions exist amongst healthcare insurance companies. The healthcare tasks offered for segment two are shown in Table 5.31.

Name	Description
Integrated care CVRM	To improve care for CVRM patients where substitution from secondary care to primary care will be realized within 3 years.
Integrated care Asthma	To improve care for Asthma patients where substitution from secondary care to primary care will be realized within 3 years
Integrated care COPD	To improve care for COPD patients and stimulate self-

management patients through a programmatic approach. This results in a lower burden of disease, and fewer complications.

To improve care for Diabetes Mellitus Type 2 patients and stimulate self-management patients through a programmatic approach. This results in a lower burden of disease, and fewer

The POH-S offers care for chronic diseases and supports the GP in

Table 5.31: Healthcare tas	ks segment two	(NIVEL,	2015b).
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In mini-game two the same mechanics apply, as players can acquire and organize healthcare tasks. Like
in mini-game one, organizing can be done by performing and assigning actions, managing staff and
managing resources to meet the terms and conditions.

healthcare and management tasks.

complications.

Players can only add healthcare tasks from segment two and not drop them (rule). However, the player can make changes to the healthcare tasks from segment one by adding or dropping them (rule). This allows them to correct possible mistakes made in the first mini-game.

Procedure 3: managing staff

Like in the first-mini game, the healthcare tasks in mini-game two require **staff (object)** members. In addition to the three types of staff members of mini-game one, the player will be introduced to one new type. This is the POH-S that should be acquired by the player to help the GPs conduct integrated care, which is divided into four healthcare tasks in segment two and presented in Table 5.32.

Staff member type	Description	Healthcare task
POH-S	Provides basic healthcare for chronic diseases for the general practice.	Integrated care CVRM Integrated care Asthma Integrated care COPD Integrated care DM2

In mini-game two players can hire the POH-S, but not fire him/her (**rule**). However, the player can make changes to the types of staff members from mini-game one by **hiring** or **firing** them (**rule**). This allows them to correct possible mistakes made in the first mini-game.

Procedure 4: managing resources

Like mini-game one, the player has to buy resources in mini-game two to meet the terms and conditions. In mini-game two, the player can buy resources that are needed for the healthcare tasks in segment one and two. Moreover, these resources can also be sold in contrast to mini-game one.

Remaining procedures

For the **observe other players** and **submit decisions** procedures nothing has changed compared to mini-game one. After the results have been submitted or the timer runs out, the player is redirected to the feedback screen of mini-game two.

5.3.3 Feedback

Mini-game two uses the same KPIs as mini-game one. As described earlier, the outcomes are different for every decision the player makes. How mini-game two decisions are related to the KPIs is described below.

KPI 1: Reducing the cost per ca pita

Like the POH-GGZ healthcare task from segment one, the healthcare tasks from segment two reduce the cost per capita as integrated care moves activities from the hospital to the general practice. Therefore, similar feedback will be presented to the player.

KPI 2: Healthcare alignment

For alignment, the new healthcare characteristics of the population will be compared to the new healthcare tasks in mini-game two. The feedback provided to the player is similar. How the new population data is related to the healthcare tasks from segment two is shown in Table 5.33.

Table 5.33: Relation Healthcare characteristic and healthcare task segment two

Healthcare characteristic	Healthcare task
Diabetic	Integrated care CVRM
High blood pressure	Integrated care Asthma
Asthma / COPD	Integrated care COPD
Diabetic	Integrated care DM2

KPI 3: Patient satisfaction

The same feedback mechanics for patient satisfaction will be used for mini-game two. The study by van den Berg et al. (2012) shows that general practices hire a POH-S for 14,2 hours (0,37 FTE) per 2,350 patients. Therefore, in the serious game the player should hire a POH-S for at least 14 hours per 2,350 patients (**rule**). The results are presented in Table 5.34.

Staff member	Ratio	Healthcare task
POH-S	14 hours (0.37 FTE) reimbursed per	Integrated care CVRM
	2,350 patients	Integrated care Asthma
		Integrated care COPD
		Integrated care DM2

We have applied a range of minus ten percent (-10%) and plus ten percent (-10%) again. For example, if a player has a population of 2,350 patients he/she should have hired POH-S that sum up to 14 hours. The player will receive positive, if he/she has hired between 13 hours (-10%) and 15 hours (+10%). If the player has hired less than the 13 hours, the player will receive a penalty on patient satisfaction. If the player has hired more than 15 hours, the player will receive a message that he/she has hired superfluous. The results are shown in Table 5.35.

Table 5.35: Feedback on availability POH-S in hours per 2,350 patients

Staff member	Total	Insufficient	Sufficient	Superfluous
POH-S	14 hours	Below 13 hours	Between 13 and 15	More than 15 hours
			nours	

The same -20% and +20% range have been applied and the percentage values from the POH-GGZ from Table 5.8 have been used and rounded off to improve the game experience. The results are presented in Table 5.36.

Table 5.36: Feedback ranges direct patient-related time POH-S per 2,350 patients

Staff member	Total	Insufficient	Sufficient	Superfluous
POH-S	9 hours	Below 7 hours	Between 7 and 11 hours	More than 11 hours

In the serious game, the player receives the same qualitative and quantitative feedback on **patient satisfaction** as shown in Table 5.19.

KPI 4: Employee satisfaction

For the employee satisfaction, the same feedback mechanics apply as for mini-game one.

KPI 5: Financial health

The overall financial health, which is the balance between the income and expenses of the general practice still apply for mini-game two. Moreover, it will show the income and expenses for the POH-S. The POH-S is reimbursed through a registration rate and per consult. To determine the average consults a POH-S conducts, we have used the study by Heiligers et al. (2012). The study reveals how the consults (contacts) are divided in percentages between the GP and POH-S, when a POH-S is acquired for the general practice.

To be able to calculate this, we need to know the average consults a general practice conducts per year. This can be derived from the NIVEL healthcare registrations for primary care database (NIVEL, 2015a). The average consults are stated per 1,000 patients and the M&I contacts are removed as these are not performed by a POH-S. Moreover, the percentage of the e-mail consult is estimated as no data is available in the study (Heiligers et al., 2012). The results are presented in Table 5.37.

Type of consult	# consults per 1,000 patients	% consults per POH-S	# consults per POH-S	% consults per GP	# consults per GP
Consult regular shorter than 20 minutes	2122	3,7%	79	96,3%	2043
Consult regular 20 minutes and longer	569	22,1%	126	77,9%	443
Visitation regular shorter than 20 minutes	113	5,8%	7	94,2%	106
Visitation regular 20 minutes and longer	81	15,7%	13	84,3%	68
Telephonic consult	1069	6,8%	73	93,2%	996
Vaccination regular	2	0,2%	0	99,8%	2
E-mail consult regular	17	0,4%	0	99,6%	17
Total	3.973	7,8%	298	92,2%	3.675

Table 5.37: Consults divided between GP and POH-S per 1,000 patients per year (Heiligers et al., 2012; NIVEL, 2015a)

This allows us to calculate how much income the GP as well as the POH-S generates on average per 1,000 patients, which is presented in Table 5.38.

Table 5.38: Formula average POH-S and GP	consults per 1,000 patients in 2014	(Heiligers et al., 2012; NIVEL, 2015a)
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Type of consult	Price per consult	# consults per POH-S	Income POH-S from consults	# consults per GP	Income GP from consults
Consult regular shorter than 20 minutes	€ 9,04	79	€ 714,16	2043	€ 18.468,72
Consult regular 20 minutes and longer	€ 18,08	126	€ 2.278,08	443	€ 8.009,44
Visitation regular shorter than 20 minutes	€ 13,56	7	€ 94,92	106	€ 1.437,36
Visitation regular 20 minutes and longer	€ 22,60	13	€ 293,80	68	€ 1.536,80
Telephonic consult	€ 4,52	73	€ 329,96	996	€ 4.501,92
Vaccination regular	€ 4,52	0	€ 0,00	2	€ 9,04
E-mail consult regular	€ 4,52	0	€ 0,00	17	€ 76,84
Total		298	€ 3.710,92	3.675	€ 34.040,12

The calculations allows us to depict that a POH-S generates \in **3.711** on average per 1,000 patients per year. Therefore, the formula for the income generated by consults is: " \in **3.711** divided by **1,000** patients times the amount of patients that are registered to the general practice". The formula for the registration rate per year is: "registration rate per patient per quarter times the amount of patients that are registered to the general practice". The formula for the registration rate per year is: "registration rate per patient per quarter times the amount of patients that are registered to the general practice times four quarters". The formulas are shown in Table 5.39.

Table 5.39: Income formula POH-S

Name	Formula	Example
Registration rate	Registration rate per patient per quarter * # patients of player's general practice * four quarters.	€ 3.80 * 2350 * 4 = € 35.720
Consult	(Average amount of income generated by a POH-GGZ per 1,000 patients per year / 1,000 patients) * # patients of player's general practice.	(€ 3.711 / 1000) * 2350 = € 8.720
Total		€ 44.440

The expenses of the POH-S are based on the required staff and resources of the healthcare task. After the player has read the feedback of mini-game one, he/she can continue to mini-game two.

5.4 Mini-game three

This section describes the game design for the third mini-game and follows the same structure of minigame one in terms of introduction, gameplay and feedback. The player will be confronted with a new **story** and changes in the **gameplay**, which is described below.

5.4.1 Introduction

The introduction of the third mini-game tells a **story** that is a follow up on the **story of the second mini-game**. The story of the third mini-game begins as follows and is described from the player's perspective.

"Congratulations, you have been running your general practice for over two years now. In 2016 you have expended your healthcare services and provided care from segment one and two. By providing integrated for your patients, you were able to gather more detailed information on their healthcare needs.

It is time to get out of your comfort zone. In 2017 you will focus on segment three in addition to first and second. Segment three is concerned rewarding healthcare outcomes and innovation.

Game objective

Your main game objective is to organize GP care for segment three, while maintaining basic GP care from segment one and multidisciplinary care for segment two. This mini-game allows you to revise the decisions made in mini-game one and two (**objective**)."

The introduction screen looks similar to that of mini-game one and two. The player can start the third mini-game by pressing a button, which is described in the next subsection.

5.4.2 Gameplay

The player will now enter the main gameplay screen of mini-game three, in which the player will be confronted with a countdown timer of twenty minutes again once again (**resource, conflict**). In the gameplay of mini-game two, there are some minor changes compared to mini-game one and two, which are related to the procedures. Mini-game three becomes more difficult as more profound decisions have to be made, while the outcomes from mini-game two are the starting point.

Procedure 1: Analyzing the needs of the patient population

As described in the **story**, the player gathered more detailed information on the healthcare needs of the patient population. This is an addition to what was provided in mini-game one and two and is presented in Table 5.40.

Table 5.40: Population	n data mini-gan	<i>ne three</i> (NIVEL	, 2015b).
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Name	Description	Туре
Overweight	The percentage and number of patients that are overweight.	Н
Obese	The percentage and number of patients that are obese.	Н
Underweight	The percentage and number of patients that are underweight	Н
Insufficient	The percentage and number of patients that do not exercise enough.	Н
exercise		
Smokers	The percentage and number of patients that smoke.	Н
Heavy smokers	The percentage and number of patients that are heavy smokers.	Н
Excessive alcohol	The percentage and number of patients that are drink excessive amounts	Н
consumption	of alcohol.	

H = health characteristics

The player can use this information to determine which new healthcare tasks he/she should acquire from segment three.

Procedure 1: Providing healthcare tasks (services)

After analyzing the new data for the **population**, the second **procedure** is acquiring and organizing healthcare tasks for segment three. In the third mini-game, the player will be presented with nine new healthcare tasks from segment three that are offered by the dominant healthcare insurance company in the region (**rule**). Like the previous mini-games, differences in rewarding, terms and conditions exist amongst healthcare insurance companies. The healthcare tasks offered for segment three are shown in Table 5.41.

Name	Description
Achievement frail elderly	Organize and provide care for frail elderly which focuses on elderly 75 of age and older.
Achievement effective drug prescription	Improving the quality of healthcare and decreasing the costs of care by rewarding effective drugs prescription
Achievement service and accessibility	To improve the service and accessibility of the general practice by offering digital alternatives to contact the general practice.
Achievement general practice accreditation	To improve the quality of the general practice.
Healthcare innovation: E- health	Use an E-health solution for digital instruments for self- management of patients, consultation, diagnostics or forms of treatment.
Healthcare innovation: Substitution	Substitution of care by moving secondary care to primary care.
Achievement integrated care DM2	Rewards partnerships and positive results gained in segment 2 for disease DM2.
Achievement integrated care COPD	Rewards partnerships and positive results gained in segment 2 for disease COPD

In mini-game three the same mechanics as in the previous mini-games apply for this procedure to meet the terms and conditions. Players can only add healthcare tasks from segment three and not drop them (**rule**). However, the player can make changes to the healthcare tasks from segment one and two by **adding** or **dropping** them (**rule**). This allows them to correct possible mistakes made in the mini-game one and two.

Procedure 3: Managing staff

Healthcare tasks in mini-game three do not require new staff members. However, the player will be introduced a new type of staff member that serve as a role as a manager and is shown in Table 5.42. The manager has medium medical and high managerial skills, which allows the player organize the healthcare tasks more effective. Unlike the previous types of staff members, using a manager in the general practice is not reimbursed by healthcare insurance companies. Therefore, the player (the general practice owner) pays the manager out of his own pockets.

Table 5.42: Staff m	ember for r	mini-game	three
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Staff member type	Description	Healthcare task
Manager	Allows the player organize the healthcare tasks more effective	All healthcare tasks

In mini-game three players can only hire a manager, but not fire him/her (**rule**). However, the player can make changes to the type of staff members from mini-game one and two by **hiring** or **firing** them (**rule**). This allows them to correct possible mistakes made in the mini-game one and two.

Remaining procedures

The **managing resources**, **observing other players** and **submitting decisions** did not change compared to mini-game one and two. After the results have been submitted or the timer runs out, the player is redirected to the feedback screen of mini-game three.

5.4.3 Feedback

Mini-game three will use the same KPIs as the previous mini-games and the outcomes are different for every decisions made. The player will receive feedback again whether the acquired healthcare tasks **reduce the cost per capita**. Moreover, population data will be related to the healthcare tasks again to determine the **alignment**. Finally, the patient satisfaction, employee satisfaction and financial health will be calculated in a similar way.

5.5 Mini-game four

This section describes the game design for the third mini-game and follows the same structure of the previous mini-games in terms of introduction, gameplay and feedback. The player will be confronted with a new **story** and changes in the gameplay, which is described below.

5.5.1 Introduction

The introduction of the fourth mini-game tells a **story** that follows up on the **story of the third mini-game**. The story of the fourth mini-game begins as follows and is described from the player's perspective.

"Congratulations, you have been running your general practice for over three years now. In 2017 you have expended your healthcare services and provided care from all the segments.

In 2018 an asylum seekers' center will be built in your area. Therefore, you will receive 1200 more patients for your general practice (example of an event, ILO 7). Moreover, you received some medical records that influenced your demographics and healthcare characteristics.

Game objective

Your main game objective is to adapt your general practice to your new population, while maintaining

care provided from the three segments. This mini-game allows you to revise the decisions made in minigame one, two and three (**objective**)."

The introduction screen looks similar to that of the other min-games. After the player has read the story and game objective, the player can start the third mini-game by pressing a button. This starting action initiates the gameplay (**procedure**) and is discussed in the next subsection.

5.5.2 Gameplay

The player will now enter the main gameplay screen of mini-game four, in which the player will be confronted with a countdown timer of twenty minutes again once again (**resource, conflict**). In the gameplay of mini-game four, there are some minor changes compared to previous mini-games. Mini-game four becomes more difficult as the player has to react to an **event** that occurs (**ILO 7**), which is important due to the constantly changing healthcare domain (Expert 1, personal communication, April 16, 2015).

Procedure 7: Event

Different players can receive different events, so they can learn from each other during the debriefing sessions after the game. Possible events that can occur are described in Table 5.43.

Name	Description
Asylum seekers' center	An asylum seekers' center is built and the player receives more patients. Moreover, it has influenced the demographics and health characteristics of the population.
General practice merger	The player has merged with another general practice, but remains the only owner. This has influenced the population data as well as the staff composition.
Overworked GP	One of the player's GPs is overworked and will be sick the rest of the year. He/she has to find a replacement.

Table 5.43: Events in our serious game

These events have influence on the remaining procedures and existing objects.

Remaining procedures

The game mechanics of **providing healthcare tasks**, **managing staff**, **managing resources**, **observing other players** and **submitting decisions** remain the same for mini-game four. The player has full control, e.g. is allowed to hire/fire his staff members and buy or sell his resources. To reach the main objective of the game, the player react the occurred events by adapting his/her general practice using the procedures. After the results have been submitted or the timer runs out, the player is redirected to the feedback screen of mini-game three.

5.5.3 Feedback

Mini-game four will use the same KPIs as the previous mini-games and will be determined on how well the player has adapted his/her general practice to the occurred event, while providing healthcare tasks from the three segments.

After the reading the feedback, the game has ended. Expert 1 (personal communication, April 16, 2015) mentions it is important for GPs to learn from each other. This is possible as each player had his own unique general practice, dominant healthcare insurance company and population. Therefore, there should be a **debriefing** session after the end of the game that allows players to:

- Explain what their population looked like
- Motivate their decision making
- Show their results.

Debriefing creates awareness on the errors and mistakes the player has made and provides him/her with the required knowledge, using a reflective process (Huynh-kim-bang et al., 2010).

5.6 Summary

This section summarizes the serious game by providing a global overview on some of the key game elements.

5.6.1 Challenge

As described in Chapter 3, it is important to provide challenge in a game to prevent the player becoming bored or frustrated. To cope with this in our serious game, the theory of flow by Csikszentmihalyi (1990) is used as a guideline and is shown in Figure 5.11.



Figure 5.11: Challenge

As described in earlier sections, each mini-game will become increasingly more difficult as the player deals with more segments at the same time and is presented with meaningful choices. Finally, after becoming familiar with segment the player has to react to an events to further maintain this flow. This **smooth learning curve** allows the player to progress gradually in the game and is used as an

engagement tool (Huynh-kim-bang et al., 2010). This is further supported by providing the player with clear goals and feedback.

The structure of the game uses intensive action phases (i.e. gameplay) and less intensive phases for thought and reflection (i.e. feedback). This aligns with the "*time for action / time for thought*" design pattern from Huynh-kim-bang et al. (2010), which provides a solution for teaching high-level knowledge in a serious game.

5.6.2 Model

This subsection describes the structure of our serious game using a simplified Unified Modeling Language (UML) class diagram. This diagram describes the structure of the system showing the relationships between the objects and is presented in Figure 5.12. For example, in our serious game a population belongs to one general practice and a general practice belongs to one population. Moreover, a general practice can acquire zero or more healthcare tasks and healthcare tasks are acquired by one more or general practices. The class diagram has been translated to an entity-relationship diagram (ERD) that has been implemented in our prototype.



Figure 5.12: UML class diagram of our serious game

The next chapter describes the evaluation approach of this thesis. Moreover it describes analysis and results of the evaluation.

6. Evaluation and results

The third step of the proposed serious game design framework is the evaluation. This chapter describes how the serious game the "General Practice Manager" has been evaluated. The first section describes the evaluation approach, while the second section describes the analysis and results of the conducted evaluation.

6.1 Evaluation approach

This subsection describes the evaluation approach for our serious game. As described in Section 3.4.3, the four serious game design approaches did not specify any evaluation approaches and methods, thus have not been included in our proposed framework. However, we do want to use an evaluation approach that is based on literature and provides us with guidelines, so that informed decisions are made. Therefore, we have used the DECIDE framework by Rogers, Sharp, Preece, & Tepper (2007), which has been widely cited and uses six stages to describe the evaluation approach. The framework provides a guiding structure, which assisted us in the evaluation process and allowed us to develop an adequate plan for the earlier mentioned defined serious game. The evaluation approach is described below, using the six stages of the DECIDE framework.

6.1.1 Determining goals

The first stage of the framework is to determine the overall goals that the evaluation addresses. The evaluation for this study addresses two high-level goals, which are determining if the intended learning outcomes and serious game design that is implemented in a prototype, align with teaching general practice management in the Dutch context. As stated in Chapter 4, the intended learning outcomes for the serious game are:

- ILO 1. A GP should be able to analyze the needs of the patient population.
- ILO 2. A GP should be able to select an adequate set of healthcare tasks
- ILO 3. A GP should be able to adequately hire staff.
- ILO 4. A GP should be able to delegate tasks among staff.
- ILO 5. A GP should be able to set out a strategy for the general practice.
- ILO 6. A GP should be able to understand financial management of a general practice.
- ILO 7. A GP should be able to respond adequately when internal and external events occur.
- ILO 8. A GP should be able to understand how managerial decisions influence the general practice.

The serious game design and prototype has been described in Chapter 5. Both high-level goals are evaluated by experts of the GP domain. We would have liked to evaluate whether the intended learning outcomes are the actual learning outcomes after having the target audience play the game. Playing the game should create awareness on the decisions a GP may have to take while managing his/her general practice and the effects of these decisions. Moreover, we would have liked to know if the game was fun to play and engaging for this target group. However, it is difficult to find them and therefore we have chosen to conduct evaluations using experts only. Involving different target groups and goals, provides different insights and may contribute to a more valuable evaluation.

6.1.2 Exploring specific questions

The second stage explores the specific questions that have to be answered and are based on the previously mentioned evaluation goals. The evaluation targets experts, thus a set of questions for this target group has been developed and is described below.

For the first evaluation goal, we have asked the experts if the intended learning outcomes for the serious game align with teaching GPM in the Dutch context. Moreover, if they are targeting the right audience, i.e. GP students and recently graduated GPs that want to have their own general practice. Firstly, domain experts have been asked to state the three most important learning objectives for GPM. Secondly, domain experts have been asked to determine if the intended learning outcomes that we stated for the serious game are important for teaching GPM to the target audience. This allows us to evaluate if the right intended learning outcomes have been addressed for the serious game and if any important learning outcomes are missing.

For the second goal of the evaluation, we have asked the experts whether the intended learning outcomes have been translated into our serious game design and prototype adequately. The evaluation focused on how the game objectives and mechanics align with GPM and if adequate criteria have been used for decision making. Finally, we also intend to find out if the right performance indicators have been addressed in the serious game. Firstly, domain experts have been asked to indicate the three most important performance indicators for GPM. Secondly, domain experts have been asked to determine if the performance indicators we stated for the serious game are relevant for GPM. Finally, the experts have been asked what the most important factors are that determine our stated performance indicators. The set of questions for the evaluation can be found in Appendix E.

6.1.3 Choosing evaluation techniques

In the third stage, the evaluation paradigm and techniques are chosen to answer the questions defined in Appendix E. Because the evaluation focuses on different goals, different evaluation techniques has been used. The evaluation has been split into two focus group sessions and individual expert interviews. The focus group sessions provide a structured discussion with pre-selected participants with similar expertise and allows us to evaluate specific parts of the serious game design. During the discussion open questions have been asked on some of the game mechanics such as the criteria to hire staff for the general practice. This provides qualitative data which can be useful for further research and development of the serious game. The focus group has been chosen upon convenience, because it was assembled for the follow-up project of this study.

For the expert interviews we have used the following methods:

- A questionnaire has been used to ask the experts on the three most important learning outcomes and performance indicators for GPM. This allows us to compare them to the ones we have stated for the serious game. Moreover, experts have been asked on the most important factors that determine our KPIs.
- The 100-dollar test uses cumulative voting and has been used to determine the importance of the intended learning outcomes/performance indicators that we have stated. Using this prioritization technique is appropriate for our study, because only a small set of items for both intended learning outcomes and performance indicators have been stated. Defining large sets of items will make it more difficult to use this technique. The 100-dollar test has been chosen above other methods, because it allows us to determine the relative difference between the items that have been prioritized by the different experts (Berander & Andrews, 2005). Moreover, the technique provides a fine granularity of analysis due to the complex level of sophistication and allows us to perform a sensitive analysis.

 Cognitive walkthrough for Learning Through Game Mechanics (Farrell & Moffat, 2013) has been used to evaluate some of the game mechanics, including the criteria for decision making. The baseline of the method has been used and adapted to the context of the serious game. The cognitive walkthrough method has been chosen, because the focus of the evaluation is not on the ludic/entertainment aspects of the game. This evaluation method allows us to ask open-ended and close-ended questions on the serious game design as described in Chapter 5, which has been transferred into a working prototype.

6.1.4 Identifying practical issues

The fourth stage identifies practical issues to address, such as the selection of participants. To find experts of the GP domain, the network of the Netherlands Institute for Health Services Research (NIVEL) has been used. Experts have been divided into general practice managers and GPs that own and/or make managerial decisions in a general practice. Moreover, one senior researcher that is highly knowledgeable in the GP domain has been involved in the evaluation. The managers have been educated and specialized in managing healthcare organizations such as a general practice, rather than providing direct medical care like GPs. The GPs that own and/or make managerial decisions in a general practice have had GP education. This is still a meaningful group to consider, because they know the balance between visiting patients and conducting managerial activities. While most of them have followed management courses, they are mainly focused on providing care for the general practice.

We expect different results from the target groups, because we expect that each target group has their own perspective on how GPM should be conducted. Several managing GPs and managers working at NIVEL have been contacted to participate in the evaluation. As described, the focus group was assembled for the follow-up project of this study, which has been described in Section 6.2.1. The prototype of the serious game has been uploaded to a Uniform Resource Locator (URL) and is accessible through the internet. This allowed us to quickly set-up the evaluation.

6.1.5 Dealing with ethical issues

In the fifth stage ethical issues are dealt with. The evaluations have been sound recorded with consent of the participants. Furthermore, the names of the participants have been anonymized. Before the evaluation, participants have been briefed on how evaluation would be conducted. Finally, the participants have been informed that their input have been presented in this study.

6.1.6 Evaluation, interpreting and presenting the data

The final and sixth stage is the evaluation itself, moreover, the interpretation and presentation of the data. This is described in the next section. The set of questions can be found in Appendix E. The summary of the evaluation approach is shown in Table 6.1.

Goals	Target groups	Methods
Alignment of the Intended learning outcomes	Experts	Questionnaire 100-dollar test
Alignment of the serious game design	Experts	Cognitive walkthrough Questionnaire 100-dollar test

6.2 Analysis and results

This section describes the analysis and results of the evaluation of our serious game. As previously described, the evaluations have been conducted using two focus group sessions and individual expert interviews. The two focus group sessions have been discussed in one subsection because the questions asked were all related to the serious game design. All participants in the expert interviews have been presented with the same set of questions and have therefore been analyzed and discussed in the same subsection. The first subsection presents the analysis and results of the two focus group sessions. The second subsection presents the analysis of the expert interviews. In the final subsection, an overview of the key findings of the performed evaluations is provided, which describes the lessons learned.

6.2.1 Focus group sessions

This subsection describes and discusses the two performed focus group sessions. During these sessions, in which we have presented specific parts of the serious game design using a PowerPoint presentation, the experts expressed their perceptions, attitudes, beliefs and opinions. The experts who participated in the focus group sessions consisted of:

- A GP in training;
- A GP working in a Medical Center;
- Two general practice owners, also being GPs;
- Medical director of a healthcare group.

Each part of the serious game design is discussed separately, presenting the input of the focus group.

Q1. Starting scenario.

We have presented our starting scenario to the experts and stated that in our serious game, the player starts from scratch, is the only employee and has a building with the necessary basic equipment in a new area.

The focus group has stated that this scenario does not occur very often, for most general practices are being taken over. Moreover, they have mentioned that taking over a general practice often means taking over the staff members who currently work there, which can have negative effects. Furthermore, that the general practice usually loses 10% of its registered patients in such a scenario. Therefore, the focus group has advised us to provide multiple scenarios for the serious game that both offers the "scratch" and "taking over" scenario.

Q2. Procedure: analyzing the patient population.

We have shown the experts that in our serious game, the player is provided with patient population data from the VAAM that has to be used to make informed decisions. For example, the total number of patients and number of patients per chronic disease.

The focus group has agreed that the data of the VAAM is useful for decision making. However, they have mentioned more data should be provided such as the number of consults a general practice performs. This should be depicted per healthcare issue.

Q3. Procedure: The number of hours that the player wants to work

We have shown the experts that in our serious game, the player can choose to work between 16 and 60 hours per week. The 16 hours is the minimum hours a GP has to work per week to keep his license. The 60 hours representing the hours a GP should work to maintain 2,350 patients (norm practice) has been derived from literature.

The focus group has mentioned that making this decision is useful, because it contributes to the learning process. They have agreed that 16 hours should be the lower limit due to re-registration laws, which are the compulsory hours that a GP should work per week to keep his/her license. Moreover, they have mentioned that the player should also receive "soft" feedback on the hours he/she chooses. According to the experts working less than 24 hours makes it impossible to manage a general practice. Furthermore, they have stated that a lot of healthcare professionals have burnouts due to the many hours they work and the stress they experience. Therefore, they have advised us that the upper limit should be raised to 67 hours or higher to provide a larger range that depicts this burnout factor. This of course depends on the person involved, but some assumptions have to be made.

Q4. Procedure: The salary that the player wants to earn

We have presented the experts that in our serious game, the player can choose a yearly gross salary between ≤ 18.000 and higher. The ≤ 18.000 depicts the minimum wage of the Netherlands and no upper limit because a GP owner can choose his/her own salary.

The focus group has stated that making this decision is useful, because it contributes to the learning process. They have agreed with a lower and no upper limit. However, they have also mentioned that the decision lacks details because they do not know if this is gross or net. Moreover, they have asked if this includes taxes and pension funds et cetera.

Q5. Procedure: hiring HIDHAs

We have shown the experts that in our serious game, the player can hire HIDHAs for the general practice. If this is needed or not, depends on the number of hours that the player wants to work him/herself. Furthermore, this is related to the number of patients that are registered to the general practice, using the defined norm practice.

The focus group has agreed that making this decision is useful, because it contributes to the learning process. They have also agreed that the hours of the player and HIDHA should be accumulated and mirrored to the norm defined by the studies of NIVEL/VPH. Moreover, they have advised us to use the current norm practice (2,168 patients) instead of the old one (2,350 patients). They have agreed with the fact that the salary of the HIDHAs should be based on the collective employment agreement.

Q6. Procedure: hiring DAs

We have presented the experts that in our serious game, the player can hire DAs for the general practice. This is also related to the number of patients that are registered to the general practice, using the defined practice norm.

The focus group has provided the same feedback as in the previous procedure, i.e. hiring HIDHAs.

Q7. Criteria for hiring staff

We have asked the experts what other criteria they have used for hiring staff members.

The focus group has mentioned that they hire staff members ad hoc. Moreover, that new staff members should "fit/match" the current team of the general practice, for example, by matching personalities or vision on GP care. For DAs, it is important that they match with the patient population as they work in the front office of the general practice.

Q8. Criteria for acquiring healthcare tasks

We have asked the experts what criteria they use for acquiring healthcare tasks, such as integrated care for patients that have diabetes.

The focus group has agreed that the extra money that is reimbursed by the healthcare insurance companies is usually the motivating factor.

Q9. KPIs

We have shown the experts that in our serious game, we use five KPIs. The five KPIs are reducing the cost per capita, healthcare alignment, patient satisfaction, employee satisfaction and financial health. Furthermore, we provided the experts with a description for each of the five KPIs.

The focus group has mentioned that reducing the cost per capita should not be a KPI, because it is a moral. Moreover, they have stated that healthcare alignment is related to patient satisfaction. They have agreed with using patient satisfaction, employee satisfaction and financial health as KPIs. For employee satisfaction, they have mentioned that the "soft" factor should be implemented per employee.

Q10. Feedback

We have presented the experts how we have modelled the feedback regarding the hours that the player/HIDHAs and DAs should work.

The focus group has agreed that if a general practice does not have sufficient hours available for a certain "type" of staff member, it will have a strong negative impact on the performed consults of the general practice. They have also agreed that if a general practice has superfluous hours available for a certain "type" of staff member, it will only have a mildly positive impact on the performed consults for the general practice, but have negative impact on the financial balance in terms of salaries.

6.2.2 Individual expert interviews

This subsection describes and discusses the expert interviews and is divided in three parts, i.e. intended learning outcomes, cognitive walkthrough and performance indicators. Each question is discussed separately, providing the answers from the experts and our remarks. The experts that participated in the expert interviews consisted of:

- A former CEO of a healthcare center;
- A senior healthcare researcher specialized in GP care;
- A GP working in a healthcare center also conducting managerial activities;
- A general practice owner, also being a GP.

These are the target groups (experts) that have been mentioned in Section 6.1.3. However, they are different experts than those included in the focus group sessions that have been described in Section 6.2.1. For each part, a summary of the interviews is given.

Part 1 – Intended learning outcomes

The first part evaluated the intended learning outcomes. Before asking experts to determine the importance for the ones we included in the serious game, we have asked experts the following question.

Q1. If you could define three ILOS for such a serious game, taking into account the target audience, what would they be?

The experts have provided us with the answers that are presented in Table 6.2.

Expert #	Intended learning outcomes
Expert 3	1. Develop a plan that determines how he/she wants his/her patients to perceive
	his/her general practice
	2. Become aware of the goals he/she defined for the general practice.
	3. Decide how he/she wants to use and deal with his/her staff.
Expert 4	1. Be aware of the decisions he/she has to make when taking over or starting a
	general practice. (e.g. alone or with a partner)
	2. Be aware that he/she has different choices when taking over or starting a
	general practice.
	3. Develop a plan to grow toward his/her "ideal" general practice. (staff)
Expert 5	Gain overall insight of managerial decisions/processes a GP owner has to deal with
	such as:
	1. Managing finances.
	2. Managing staff.
	3. Managing healthcare tasks (modules/services).
Expert 6	1. Develop a plan to structure the organization.
	2. Understand which healthcare tasks (services) can be contracted and make a
	long-term plan.
	3. Delegate and reallocate tasks.

Table 6.2: Three intended learning outcomes defined by the experts

The answers that have been provided by the experts differ (from each other), but also have some overlap. The intended learning outcomes defined by expert 4 mostly focus on the process towards taking over or starting a general practice. Experts 3, 4 and 6 have depicted that it is important to make a plan that determines the strategy/structure for the general practice, how to deal with staff, managing healthcare tasks and finances are a part of. They have elaborated that this plan should be made before conducting GPM.

Comparing the intended learning outcomes to the ones we have stated for the serious game, we can depict similarities among certain aspects of GPM, for example, setting out/determining a strategy for the general practice should be the main learning outcome of the game. Moreover, that managing staff and healthcare tasks (services) are important. The results are presented in Table 6.3, which show that 6 out of 8 intended learning outcomes of our game match with that of the experts and are discussed in Section 6.2.3.

#	Statement	E3	E4	E5	E6
1	A GP should be able to analyze the needs of the patient population.				
2	A GP should be able to select an adequate set of healthcare tasks			х	х
3	A GP should be able to adequately hire staff.	х		х	
4	A GP should be able to delegate tasks among staff.	х			х
5	A GP should be able to set out a strategy for the general practice.	х	х		х
6	A GP should be able to understand financial management of a general practice.			х	
7	A GP should be able to respond adequately when internal and external events occur.				
8	A GP should be able to understand how managerial decisions influence the general practice.			Х	

Table 6.3: Comparison of intended learning outcomes between our serious game and experts (E = Expert)

Q2. For our serious game, we have defined the following ILOS. Imagine that you have 24 coins to divide over the following ILOS to determine their importance. Taking this into account, the target audience, please divide these coins.

The experts have prioritized the intended learning outcomes using the 100-dollar method as presented in Table 6.4.

Table 6.4: Prioritization of intended learning outcomes by experts with 100-dollar test

#	Statement	E3	E4	E5	E6	Weighted average #	Weighted average %
1	A GP should be able to analyze the needs of the patient population.	4	6	1	0	2,75	11,5%
2	A GP should be able to select an adequate set of healthcare tasks	0	0	3	4	1,75	7,3%
3	A GP should be able to adequately hire staff.	7	6	3	4	5,00	20,8%
4	A GP should be able to delegate tasks among staff.	4	0	3	4	2,75	11,5%
5	A GP should be able to set out a strategy for the general practice.	8	6	3	4	5,25	21,9%
6	A GP should be able to understand financial management of a general practice.	0	6	5	4	3,75	15,6%
7	A GP should be able to respond adequately when internal and external events occur.	0	0	3	4	1,75	7,3%
8	A GP should be able to understand how managerial decisions influence the general practice.	1	0	3	0	1,00	4,2%

Looking at the results, we have noted that the experts depict adequately hire staff, setting out a strategy and understanding financial management as the three most important intended learning outcomes. Although only one expert has mentioned this in question one, understanding financial

management was highly rated by most experts. The experts have also made remarks and briefly elaborated on their answers to support their decisions, which provided better insights in the why.

Experts 5 and 6 have said that analyzing the population is not that important, because most information can be extracted from the GP information system (*Huisarts Informatie Systeem*, HIS). Moreover, because patients are seen on a daily basis and this also provides these insights. Note that the HIS only provides the data and that the analysis has to be conducted the by the GP him/herself. Experts 3 thought about this differently, because the expert believed that GPs often do not know their patients and their issues well enough. The expert referred back to the old days, where GPs knew almost everything about their patients.

Expert 3 has also mentioned that a general practice should provide all available healthcare services, which according to the expert is possible if managed adequately. Expert 4 has supported this by stating that most general practices provide the same healthcare tasks. However, this does not align with the opinion of the other two experts. We believe that these differences are caused by the new funding model for GP care that not everybody is familiar with yet. Expert 3 has also mentioned that a GP owner should hire an accountant to manage his/her finances and therefore did not find this important. The experts did not elaborate on ILO 7. Furthermore, most experts questioned ILO 8, because they thought that this was a given fact and expected that the serious game would provide feedback on the decisions made regarding the other seven intended learning outcomes.

Part 2 – Cognitive walkthrough

The second part evaluated the serious game design using a cognitive walkthrough for learning through game mechanics. We have asked experts the following questions, which is elaborated on below.

Q3. Do you think that "starting from scratch, being the only employee" is an adequate starting scenario for the target audience?

Expert 3 has stated that taking over an existing general practice, including building/staff would be more realistic. Moreover, players should be able to choose, which "type" of general practice they want to take over that belongs to a certain "type" of area (patient population). Expert 4 has confirmed that the starting from scratch scenario is adequate, because it enhances the thinking process. Expert 5 has mentioned that the "scratch" scenario does exists, but not very often compared to taking over a general practice. She has advised us to offer both scenarios in the serious game, which is being supported by expert 6.

Q4. How do you analyze the needs of your patient population?

All experts have agreed that a lot of information on the needs of the patient population can be extracted from the GP information system. They have mentioned information such as the number of patient contacts including related issues and demographics can be provided by the HIS. However, expert 6 has depicted that you do need a HIS that supports this.

Q5. In case you did not have this information, how would you analyze the needs of your patient population?

All experts have agreed that you should look for external resources that can help you retrieve this information. Expert 3 has mentioned research institutes like NIVEL and TNO have a lot of data that is publicly available. Expert 4 has said that there are characteristics that apply to 95% of the patient populations, which is taught in the GP education. Expert 5 has stated that healthcare insurance companies, healthcare registration networks and the municipality have this information. Expert 6 has mentioned that healthcare insurance companies provide this information by providing URLs. As an example, expert 6 mentioned among others the VAAM that is applied in our serious game.

Q6. Suppose that you are analyzing the needs of your patient population and you find out that a certain percentage (and number) of patients have a "high risk on anxiety or depression disorders". You compare this information to that of municipality and/or the country, and you find out that this specific health characteristic is higher in your area than that of the municipality and/or the country. Based on this criteria (screenshot A and B), would you select the POH-GGZ healthcare task?

All experts have agreed that this would be adequate, but most of them also mention that more information should be provided to determine this. This is discussed in question 7.

Q7. Are there other criteria you would use for selecting healthcare tasks?

Expert 3 has said that would make sense and adds that a SWOT analysis should be used to determine this. Expert 4 has mentioned that more information should be provided such as the number of consults the general practice performs with respect to mental healthcare. Moreover, the "type" of mental healthcare problems to make it more realistic. Expert 5 and 6 have supported the comments of expert 4 and adds that GP should be aware of the advantages/disadvantages of such a healthcare task. To give an example, experts 5 and 6 have mentioned that acquiring the POH-GGZ would save the GP time. Moreover, allows better/cheaper care for his/her patients, due to better coordination and less referrals to secondary care providers.

Q8. Suppose that you are analyzing the needs of your patient population and you find out that a certain percentage (and number) of patients have the Turkish nationality. You compare this information to that of municipality and/or the country, and you find out that this specific demographic is higher in your area than that of the municipality and/or the country. Based on this criteria (screenshots A and C), would you hire a staff member that also has the Turkish nationality?

Expert 3 has agreed that in such a situation at least one staff member of the general practice should speak the same language, which has been supported by expert 6. Expert 4 has mentioned that in such cases the patient often brings a family member that speaks Dutch and the Turkish language. However, understands that it may be useful in certain situations. Expert 5 has agreed with this and advocates for diversity in the general practice.
Q9. Are there other criteria you would use for hiring staff members?

Expert 3 has stated that it is important that staff members of a general practice share the same vision on patient care as the owner. Experts 4 has mentioned that the personalities of the general practice team should match to promote cooperation. Expert 5 has agreed with expert 4, but also adds that the best candidate for the job should be chosen in terms of skills. Moreover, staff members should have good communication skills, be flexible and should be liked by patients. Expert 6 has mentioned that only certified staff members that have relevant competences such as working independently should be hired. Furthermore, there should be matching personalities as depicted by experts 4 and 5.

Q10. Suppose that you have task that requires a certain medical and/or management skill-level and you want to delegate to another staff member, for example to your DA. Moreover, you know the medical and management skill-level of your DA. Based on this criteria (screenshot D), would you delegate this task to your DA?

All experts have agreed that this is the most important criteria for task delegation. Expert 4 and 5 have both mentioned that there should be three skill-levels, i.e. intermediate vocational education (MBO), university of applied sciences (HBO) and University (WO).

Q11. Are there other criteria you would use for delegating tasks?

Expert 3 has stated it is important that task delegation also fits within the culture of the general practice. For example, if the general practice has an open culture, some tasks should be delegated to the DA that align with this culture. Expert 4 did not mention any other criteria. Expert 5 has mentioned that clear conditions should be imposed for task delegation and that tasks should only be delegated to staff members that have a certain affinity with the task. Expert 6 did not mention any other criteria, but says it is important to teach the player the consequences of not delegating tasks.

Q12. What do think of the overall concept of the game, i.e. providing population-based healthcare starting with S1 and ending with an events?

All experts have agreed that gradually increasing the complexity of the serious game would be the best choice. Moreover, they like the concept of the serious game. Expert 3 has mentioned that the target audience only possesses little knowledge on GPM and are that they mostly trained in diagnosing /treating patients. Expert 6 has stated that in the real-world such a structure would probably never happen, but believes this is still the best flow for learning.

Part 3 – Key Performance Indicators (KPIs)

The third part evaluated the KPIs, which are part of the serious game design. Before asking experts to determine the important for the ones we stated for the serious game, we have asked experts this following question.

Q13. If you could define <u>three</u> KPIs for such a serious game, taking into account the target audience, what would they be?

The experts have provided us with the answers that are presented in Table 6.5.

Table 6.5: Three H	KPIs defined	by the	experts
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Expert	Performance indicators
Expert 3	1. Patient satisfaction
	2. Complaints
	3. Employee satisfaction
Expert 4	1. Work load per employee
	2. Financial health
	3. Patient satisfaction
Expert 5	1. Financial health
	2. Patient satisfaction
	3. Feedback on quality per healthcare task (module/services)
Expert 6	1. Patient satisfaction
	2. Financial health
	3. Employee satisfaction

Most answers provided by the experts overlap with each other and only small differences can be depicted. All experts have agreed that patient satisfaction is an important performance indicator for GPM. Moreover, employee satisfaction and financial health have been mentioned by most experts. Expert 3 has mentioned that complaints is an important factor, i.e. complaints from patients and employees.

Comparing the performance indicators to the ones we have stated for our serious game, we can depict that our serious game design aligns with what the experts have mentioned. Expert 5 has stated that the quality (performance) should be measured per healthcare task, which aligns with what has been designed in our serious game. Perfecting this feedback mechanic will be a tremendous amount of work, but would most likely be very valuable. The results are presented in Table 6.6, which shows that 3 out of 5 performance indicators match with that of the experts and are discussed in Section 6.2.3.

A detailed overview and discussion of which factors determine these performance indicators is described in question Q15 to Q19. There it also becomes clear why healthcare alignment and reducing the costs have not been mentioned at all.

Table 6.6: Comparison key performance indicators between	our serious game and experts (E = Expert)
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#	KPI	E3	E4	E5	E6
1	Reducing the cost per capita, i.e. reducing the costs				
	for the general practice, patients and government.				
2	Healthcare alignment, i.e. matching supply and demand.				
3	Patient satisfaction , i.e. how patients perceive care and services.	х	х	х	х
4	Employee satisfaction , i.e. how employees perceive working at the general practice.	х	х		х
5	Financial health , i.e. keeping the general practice financial healthy.		х	х	х

Q14. For our serious game, we have defined the following indicators. Imagine you have 15 coins to divide in total over the following indicators to determine their importance. Taking this into account the target audience, please spend these coins.

The experts have prioritized the performance indicators using the 100-dollar method as presented in Table 6.7.

#	КРІ	E3	E4	E5	E6	Weighted average #	Weighted average %
1	Reducing the cost per capita , i.e. reducing the costs for the general practice, patients and government.	0	0	2	2	1,00	6,7%
2	Healthcare alignment, i.e. matching supply and demand.	0	0	1	2	0,75	5,0%
3	Patient satisfaction , i.e. how patients perceive care and services.	6	5	4	3	4,50	30,0%
4	Employee satisfaction , i.e. how employees perceive working at the general practice.	5	5	4	4	4,50	30,0%
5	Financial health , i.e. keeping the general practice financial healthy.	4	5	4	4	4,25	28,3%

Table 6.7: Prioritization key performance indicators by experts with 100-dollar test

Looking at the results, we note that patient satisfaction, employee satisfaction and financial health have been depicted as the most important KPIs once again. This aligns with what the experts have stated in the previous question. Questions were raised presenting the healthcare alignment KPI, because most experts thought this was related to patient satisfaction. After explaining the healthcare alignment KPI, the experts understood what we meant to depict with this KPI. However, both healthcare alignment and reducing the costs per capita have still scored very low. For the KPIs, the experts have also made remarks and briefly elaborated on their answers to support their decisions, which provided better insights in the why.

Expert 3 has mentioned that reducing the costs per capita should not be a KPI and advocated that providing high-quality healthcare is the most important. Experts 5 and 6 have agreed that this should be a KPI, but have mentioned that this should not be the primary focus. For the healthcare alignment KPI, we believe that most coins have gone to patient satisfaction.

Q15. What is the **most important** factor that determines "reducing the cost per capita"?

As described earlier, expert 3 did not think this should be a KPI and therefore did not provide an answer. Experts 4, 5 and 6 have determined effective referral of patients as the most important. The experts did agree that providing healthcare tasks such as "POH-GGZ" does reduce the costs on a macro-level as designed in our game.

Q16. What is the **most important** factor that determines "healthcare alignment"?

After explaining this KPI, the experts have provided us with the following answers. Expert 3 has stated that the alignment of the whole organization, i.e. employees, healthcare services and task delegation is the most important. Expert 4 did not provide an answer as the expert related the KPI to patient satisfaction. Expert 5 has mentioned that this is determined by effective collaboration between the different employees of the general practice. Expert 6 has stated that it is determined by matching issues that patients have with the appropriated actions.

Q17. What is the **most important** factor that determines "patient satisfaction"?

Expert 3 has referred to the six factors that are often mentioned in primary care, i.e. providing **safe** care by **skilled** employees that are **friendly** and **swift**, **close** to home and **beneficial**. Expert 4 **has** mentioned that there should be enough time for consults and wait times should not be too long, which has been supported by expert 6. Expert 5 has said that it is important that patients can reach the general practice by telephone quickly.

Q18. What is the most important factor that determines "employee satisfaction"?

Expert 3 has mentioned the recognition by the general practice owner for the performed work. Expert 4 has stated that the work load (pressure) is very important. Expert 5 and 6 have mentioned that it is important that employees are being heard by their general practice owner, for example, about idea's to improve the general practice.

Q19. What is the most important factor that determines "financial health"?

All experts have agreed that the income and expenses are the most important, which is pretty obvious. Expert 5 has said that the legal form of the general practice should be intertwined with the financial balance, while expert 6 has mentioned the cost-benefit for healthcare tasks.

6.2.3 Overview of the key findings

This subsection provides an overview of the key findings of the performed evaluations, which describes the lessons learned that should be used for the next version of our serious game. It also presents the related findings between the focus group sessions and individual expert interviews evaluations, and our remarks.

Intended learning outcomes

We have only evaluated the intended learning outcomes, using the individual expert interviews, thus cannot be compared to the focus group sessions. As shown by the answers to Q1 and Q2 in Section 6.2.2, we can conclude that setting out/determining a strategy for the general practice should be the main learning outcome of the game. This has been implemented in our serious game, however, experts have also mentioned that this plan/strategy that depicts the "ideal" general practice should be developed beforehand. Therefore, we should explore how the player can develop this plan/strategy beforehand, so that it can be compared with the decisions the player makes in our serious game.

Moreover, delegating tasks to staff members and hiring adequate staff members have also been stated as important intended learning outcomes by the experts, which covers a large part of our serious game, thus should remain. This also applies to selecting (and organizing) healthcare tasks (services), which has been mentioned twice in Q1, but has scored below average in Q2. We believe this is the case, because not all experts are that familiar with the new funding model for GP care yet. However, we believe that this is still an important intended learning outcome that should remain for our serious game, because GPs have to make strategic choices for the general practice regarding this new funding model.

Analyzing the needs of the patient population was not considered important in Q1, but found more support in Q2. We believe that it was not considered important at first, because most staff members of a general practice know their patients well and believe that this information is a given. Despite the fact that this intended learning outcome has scored average, it is still important for our serious game because all decisions made should be based on the patient population. Responding adequately when internal and external events occur has not been mentioned in Q1 and has scored very low in Q2. Furthermore, none of the experts have elaborated on this because they may consider it as an everyday activity. However, we believe this still an important intended learning outcome, because of the healthcare sector that changes regularly. Moreover, because these occurring events can also influence the other intended learning outcomes and game mechanics, thus should remain. Most experts thought that understanding how managerial decisions influence the general practice was a given fact and the purpose of the game, therefore may have received a low score. However, we have defined it to show how one or more decisions can influence one or more KPIs. Moreover, this is related to the feedback the player receives, which is a large part of our serious game.

Start scenario

As presented by the answers to Q1 in Section 6.2.1 and Q3 in Section 6.2.2, we should consider changing our serious game design for the start scenario. Both evaluation have shown that both the "scratch" and "taking over" scenario should be offered to the players. This could be done by creating multiple scenarios for the game, where the players can choose from. This way, players can play and learn from both "types" of starting scenarios. The "scratch" scenario could stay the same, while the "taking over" scenario could include taking over staff members and financial situation from the previous general practice owner. Finally, different variants should be provided for both types.

Analyzing the patient population

As shown by the answers to Q2 in Section 6.2.1 and Q4, Q5 in Section 6.2.2, providing patient population data from the VAAM by the virtual HIS as presented in our serious game seems adequate. However, we should consider providing more information, such as the number of consults that are performed by the general practice per health issue. Moreover, we should explore the information exchange and collaboration between a municipality and GP. This could lead to more necessary patient population data and/or game mechanics. This would make our serious game more realistic. Moreover, it may stimulate (for) better decision making by players, when selecting and organizing adequate healthcare tasks and managing staff.

Acquiring and organizing healthcare tasks

As presented by the answers to Q3 in Section 6.2.1 and Q6, Q7 in Section 6.2.2, we should provide more patient population data that is related to this decision. Moreover, we should also show the advantages and disadvantages per healthcare task, which could be provided in the gameplay or in the feedback. However, we can conclude that the information we have used in our serious game to describe the healthcare tasks is adequate, such as the goal, reimbursement rate and terms/conditions.

Hiring staff members

As shown by the answers to Q5, Q6, Q7 in Section 6.2.1 and Q8, Q9 in Section 6.2.2, we can use

demographic data such as the nationality as criteria to adequately hire staff members. We should explore other demographics that we can relate to this game mechanic. Moreover, we could examine if it is possible and wise to add profiles to our serious game that depict "matching" personalities, so that staff members "fit" the current general practice team. However, this may be extremely difficult to do in a game without making the game too complicated.

Delegating tasks

As presented by the answers to Q10 to Q11 in Section 6.2.2, the current game mechanic (using skilllevels) seems adequate for delegating tasks to staff members. While the experts have also provided us with other criteria, they seem difficult to transfer to a game at first. However, they may be worth to explore.

Concept of the game

As shown by the answers to Q12 in Section 6.2.2, the game concept and flow are adequate. Therefore, we can continue using our current concept and gradually increase the complexity of the serious game. However, we should measure the level of knowledge the target audience possesses before implementing new game objectives and game mechanics.

Player determine his/her own working hours and salary

As presented by the answers to Q3 and Q4 in Section 6.2.1, these game mechanics have been determined useful and contributes to the learning process. However, we should add more detail to avoid confusing for the player and make it more realistic. In the current state, players will be misled which will have a negative influence on the effectiveness of the serious game.

KPIs

As shown by the answers to Q9. in Section 6.2.1 and Q13 to Q19 in Section 6.2.2, we can conclude that patient satisfaction, employee satisfaction and financial health are the most important KPIs for GPM. However, we should consider removing reducing the cost per capita as a KPI and provide it as background information for healthcare tasks only. Moreover, healthcare alignment could potentially be merged with patient satisfaction.

Furthermore, we should explore the factors that determine these KPIs, which have been stated by the by the answers to Q15 to Q19 in Section 6.2.2. Some already been have implemented, such as the "soft" factor that presents the work load per employee. Moreover, the time for consults and wait times in our serious game are related to the total and direct hours that GPs work in the general practice. Therefore, we should keep them in our serious game.

We should consider implementing the legal form of the general practice into the financial balance, because it influences how the income and/or costs of the general practice are divided. Moreover, the availability by telephone could be determined by the total hours that a DA works, which has already been implemented in our serious game design. However, referring patients effectively may be difficult to design and implement in our current serious game as it could be a game of its own. The same applies for staff members being recognized by the general practice owner for their performed work.

As presented by the answers to Q10 in Section 6.2.1, our feedback regarding the hours that GPs and DAs work seems adequate. We should continue using the same algorithm for future modelling of the KPIs. As previously mentioned, perfecting our feedback mechanics will be a lot of work, but will most likely contribute to realism and effectiveness of the serious game.

7. Conclusion and Discussion

This chapter presents the conclusions and discussion of this study. The first section describes the conclusions, which provides answers to the research questions stated in Chapter 2. The second section describes the limitations of this study and the third section provides directions for future research.

7.1 Conclusions

First, the sub-questions are answered followed by a conclusion regarding the main research question.

1. What are serious games and what are methods for serious game design?

We have explained the concept and added value of serious games. Our literature study has shown that there are many methods available that support serious game design. In Chapter 3 we have provided an overview of some of the available approaches, such as serious game design frameworks. Each approach provided a different point of view to serious game design and we concluded that not one approach covers all aspects. We have depicted both differences and similarities, while analyzing these different approaches. Moreover, we have shown that most approaches are not holistic, abstract (high-level) and not adequate to accurately describe a serious game design. Therefore, we proposed a new framework that combined some of these approaches and depicted the key steps in the serious game design process. Our proposed framework consists of three key steps, i.e., define intended learning outcomes, game design and the evaluation, which helped us systematically design our serious game.

2. What lessons can be learned from existing related serious games?

We have identified three existing related serious games by performing a literature study. In Chapter 3 we have provided an overview of these related serious games for healthcare management. We have described the design, player experiences and results of the evaluation for each game. Although only one related game focused on GPM, the other two games did simulate similar processes and roles related to GPM. The results of the evaluations have shown that simulating processes and GPM in a virtual environment can create awareness and increase learning. Unfortunately, only one game focused on GPM and no detailed design has been provided for any of the serious games. Therefore, the lessons learned from existing related games were limited. We have also stated the positive and negative points for each game that formed the (anti-)requirements for our serious game.

We have met the requirement: "simulating GPM in a virtual environment with its processes and roles to create awareness" by designing and developing a virtual environment that implements a micro world interaction, which allows players to shape and revise the general practice as an organization. We have avoided the anti-requirement: "the serious game only focuses on a small part of GPM" by focusing on different parts of GPM that form a holistic serious game. We have avoided the anti-requirement: "no detailed serious game design has been provided" by providing a detailed description of our serious game design, using our

proposed framework.

3. What are the intended learning outcomes for teaching general practice management based on educational plans, literature and according to experts?

To determine the intended learning outcomes for the serious game, we have analyzed GPM curricula and performed a literature study. This resulted into a large set of intended learning outcomes that were high-level and too broad. Therefore, we have also conducted an expert interview to scope and determine the final intended learning outcomes for the serious game. This resulted into a list of eight intended learning outcomes, which are:

- ILO 1. A GP should be able to analyze the needs of the patient population.
- ILO 2. A GP should be able to select an adequate set of healthcare tasks.
- ILO 3. A GP should be able to adequately hire staff.
- ILO 4. A GP should be able to delegate tasks among staff.
- ILO 5. A GP should be able to set out a strategy for the general practice.
- ILO 6. A GP should be able to understand financial management of a general practice.
- ILO 7. A GP should be able to respond adequately when internal and external events occur.
- ILO 8. A GP should be able to understand how managerial decisions influence the general practice.
- 4. How to design and develop a serious game prototype for general practice management?

In Chapter 5 we have encoded the intended learning outcomes into a justified serious game design using our proposed framework. Every design decision made has been supported by literature and performed interviews, in which both the intended learning outcomes and game design components from our framework have been taken into account. This resulted into a serious game design, where players run and make decisions on their own general practice from scratch in a virtual environment. The serious game has been divided into four mini-games and is based upon the new funding system for GP care. Each min-game starts with an introduction, followed by the gameplay and ends with feedback on the decisions made by the player. The game gradually increases in complexity and includes an event in mini-game four, in which the player has to respond and this is shown in Figure 5.11 on page 97.

The main objective of the serious game is to deliver population-based healthcare, firstly by understanding the needs of the patient population. Based on these needs, the player should acquire/organize healthcare tasks and hire adequate staff. Moreover, the player has to effectively delegate the provided healthcare tasks among staff members, allowing the player to set out his own strategy. After the player submits the results, he/she receives feedback, based on the decisions made during the game, for example, how the decisions have influenced the financial situation of the general practice. This experience is intended to create awareness on the managerial decisions a GP has to make and the effects of these decisions.

5. How can our designed and developed serious game be evaluated against the learning outcomes for teaching general practice management?

We have used the six stages of the DECIDE framework to describe our evaluation approach. The evaluation was split into two focus group sessions and four individual expert interviews. The goal of the evaluation was to determine whether the intended learning outcomes and serious game design were adequate. Moreover, if they were aligned with teaching general practice management in the Dutch context. For the intended learning outcomes and KPIs, we have used a questionnaire and the 100-dollar test to determine their importance and identify if any were missing. Finally, we have used a cognitive walkthrough and another questionnaire to evaluate other parts of the serious game design.

Unfortunately, we did not evaluate the engagement and effectiveness of our serious game, which would have contributed to a more complete evaluation. The initial plan was to involve the target audience in the evaluation to determine if the intended learning outcomes are the actual learning outcomes. However, it was difficult to find them and therefore we had chosen to conduct evaluations with experts only. Moreover, we would have liked to evaluate the engagement of our serious game, but did not have enough time to find and conduct an evaluation that included professional game designers.

The main research question of our study was:

"What can be learned from the design and development of a serious game for teaching general practice management in the Dutch context?"

After analyzing the conducted evaluations, the results of our study look promising. Both the focus group sessions and individual expert interviews have shown that the presented serious game design for GPM as presented in Chapter 5 is a decent first attempt. The insights and findings from the experts indicate that the defined intended learning outcomes and serious game design partly align with teaching general practice management in the Dutch context.

Our serious game seems suitable for the target audience, i.e. GP students and recently graduated GPs that want to start or take over a general practice. The experts are enthusiastic about our serious game concept and find our flow that gradually increases the complexity adequate. The *General Practice Manager* allows players make decisions on their own general practice in a safe virtual environment. The experts indicated that the qualitative and quantitative feedback the player receives through KPIs is also adequate. Therefore, we believe that our serious game will create awareness of the core managerial business processes of a general practice.

However, we can also conclude that there is room for improvement. For example, some game mechanics of our serious game design need to be changed to make them more adequate. Furthermore, the findings from the experts reveal that more details are required to make the serious game more effective and realistic. Therefore, the results described in Chapter 6 should serve as recommendations and improvements for our serious game, which we should consider implementing in the next version.

Reflecting back on the study, we believe that creating an effective and engaging serious games takes a considerable amount of time. Moreover, the process used for this project can be depicted as a waterfall model, while an iterative process would have been more adequate. However, we do see the added value of using literature, document analyses and expert interviews to make informed choices when creating serious games.

7.2 Limitations

The performed study has several limitations. Despite the fact that our proposed framework has been based on scientific literature, it has not been validated. Moreover, the systematic serious game design approaches used for the framework have their own limitations. The framework could be validated by including more existing serious game design approaches and/or serious game design professionals. Moreover, by developing more serious games using our proposed framework, i.e. conduct multiple case studies. For our related serious games, we have searched both scientific and non-scientific literature. However, the results are limited to the keywords and the snowball method that has been used. Moreover, in this study a lot of grey literature has been used, which may have influenced the quality.

In Chapter 4 the Dutch GPM curriculum and expert interview have been translated from Dutch into English. Despite our best efforts, information could have been lost and/or misinterpreted. This also applies for the other conducted expert interviews. For the curricula comparison, we have only searched for cohesive intended learning outcomes and did not look for differences. Moreover, only a limited number of intended learning outcomes were stated for our serious game and have these been chosen by the researchers, while many more are available for GPM. These limitations may have had a negative impact on the serious game design.

Another limitation was the available time to design and develop the serious game, which was roughly nine months. The main author was not familiar with the GP domain and a vast amount of time was needed to fully understand the concept of GPM. Therefore, not much time was left to design/develop the serious game and assumptions regarding the game mechanics had to be made, which may have affected the quality.

Unfortunately, the target audience was not involved in the evaluation, to determine the effectiveness of the serious game by playing it. Moreover, we estimated the level of knowledge of the target audience and did not measured it beforehand. Furthermore, no serious game designers participated in this study, which could have provided us with early feedback on the design and helped us evaluate the engagement (entertainment value). Only few experts participated in the evaluation and not all parts of the serious game design were evaluated, which makes generalization of the results difficult.

Finally, despite the fact that the complete process of this study has been described in detail, it may still be difficult to repeat it. Factors that contribute to this are the immaturity of the serious gaming field and the evolvement of the serious game as time passes. Moreover, experts will become more familiar with the new funding model for GP care, which may influence their input for the serious game design and their answers to the evaluation questions.

7.3 Future work

Firstly, additional research is needed to validate if the proposed framework is useful and effective. So far the framework only has been used in our study and future research should explore whether it can be used to design other serious games. Looking at the many intended learning outcomes for GPM, we depict generic learning processes that apply for each type of organization such as hiring staff members.

Additional research on existing serious games can be conducted to assess how these learning processes are encoded into game mechanics, to improve our serious game. Moreover, findings from the experts should be further explored for the same reason.

To determine the effectiveness of the serious game, the target audience should be involved in the evaluation by letting them play the game and conduct a pre-test/post-test, moreover, to determine if the implemented game elements contribute to fun and engagement. To further improve this, one could explore the concept of gamification, to stimulate the player's behavior. We also experienced that it is difficult to translate certain intended learning outcomes to game objectives and learning processes to game mechanics in our digitalized serious game. For example, intended learning outcomes such as motivating staff members, which can be depicted as important for GPM. Therefore, one could explore the use of mixed reality to make our game more realistic and effective.

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Appendix A: Original GPM theme

1. Vision	
Description	Develops a personal vision on primary care as well as a vision for the general practice providing the primary care.
Learning outcomes	A GP student should be able to:
	 1.1. Formulate what he think is good GP care and what kind of GP he wants to be for his patients. (Formulate vision) 1.2. Keen himself informed of developments in the field in which
	the general practice operates. (Informed of developments)
	 Reflect upon the organization of its own general practice in terms of strengths and weaknesses and personal goals. (reflect on organization)
	1.4. Create a proposal for the development of the general practice based upon the above mentioned bullet points. (Create general practice development proposal)
Required competences	Communication
	Organize
	Act responsibly
	Professionalism

2. Systematic improvemen	t
Description	Creates an improvement plan and implements it
Learning outcomes	A GP student should be able to:
	 2.5. Formulate a plan for improvement plan for general practice management or medical practice (analysis, improvement plan and evaluation plan). (Formulate improvement plan) 2.6. Create a budget. (Create budget) 2.7. Establish support from the general practice staff for the improvement plan. (Establish support from staff) 2.8. Act as a project manager for the improvement plan. (Act as project manager)
Required competences	Medical expert
	Collaboration
	Organize

3. Supervision			
Description	Supervises individual staff members in the general practice when performing defined actions.		
Learning outcomes	A GP student should be able to:		
	3.6. Know the tasks and competences of the practice assistant and practice nurse. (Know tasks and competences staff)		
	3.7. Evaluate the performance of the practice assistant and practice nurse. (Evaluate performance staff)		
	3.8. Delegate tasks to the practice assistant, practice nurse and other general practice staff. (Delegate tasks to staff)		
	3.9. Provide feedback on the performance of the practice assistant and practice nurse. (Provide feedback performance staff)		
	3.10. Supervise a general practice staff member when learning a medical activity or action. (Supervise staff member learning new activity)		
Required competences	Medical expert		
	Collaboration		
	Organize		
	Knowledge and science		

4. Patient safety				
Description	Contributes to patient safety by reporting, analyzing and dealing with			
	safety problems of patients.			
Learning outcomes	A GP student should be able to:			
	4.7. Recognize unsafe situations, in the form of errors/mistakes,			
	mistakes about to happen and potential dangerous			
	situations. (Recognize unsafe situations)			
	4.8. Use the VIM (Reporting incidents in a safe way). (Use VIM)			
	4.9. Analyze unsafe situations (reported incidents) and			
	denominates weak links in the healthcare system			
	((structures, processes, procedures or persons). (Analyze			
	unsafe situations)			
	4.10. Create an improvement plan to improve safety of			
	patients. (Create improvement plan)			
	4.11. Implement and evaluate an improvement plan (is a			
	role model, convinces team members of the necessity of the			
	changes, stimulates employees in implementing the change).			
	(Implement and evaluate improvement plan).			
	4.12. Contribute to a safe incident reporting environment			
	(culture) in the general practice that is used for training.			
	(Contribute to safe incident reporting environment)			
Required competences	Medical expert			
	Collaboration			

5. Finance and business management			
Description	Has insight in the financing and management of general practices, claims/decelerates the expenses of own operations and advises patients on financial consequences of a medical treatment/diagnostics.		
Learning outcomes	A GP student should be able to:		
	 5.8. Keep own knowledge of healthcare financing up-to-date, such as knowledge of negotiation results LHV and other parties and understands the relevance for the general practice and patients. (Keep knowledge healthcare financing up-to-date) 5.9. Understand financing structures concerning primary and integrated care. (Understand financing structures) 5.10. Know the key developments and its relevance for its practice and patients (WMO, AWBZ and supplementary insurance policies and the position of the municipalities). (Know key developments and relevance for general practice) 5.11. Understand the incomes and expenses of the general practice. (Understand incomes and expenses general 		
	practice)		
	5.12. Claim the expenses of its own operations. (Claim		
	expenses)		
	medical treatment/diagnostics. (Advise patients on financial consequences)		
	 5.14. Reckon with patients using personal finances, the relevance of an (additional) policy and handles accordingly. (Reckon patients using personal finances) 		
Required competences	 Communication Collaboration Organize 		

6. Multidisciplinary team				
Description	Represents the general training practice for a specific theme in a multidisciplinary team.			
Learning outcomes	A GP student should be able to:			
	6.8. Understand the goal of multidisciplinary collaboration. (Understand goal of multidisciplinary collaboration)			
	6.9. Be aware of its role and position and that of other parties in consultations. (Be aware of roles and positions in			
	consultations)			
	or representative of the general practice or group of general			
	6.11. Apply discussion and negotiating skills. (Apply			
	discussion and negotiating skills)			
	6.12. Agree on the sharing of responsibilities. (Agree on			
	sharing responsibilities)			
	6.13. Chair meetings, create agendas and create/discuss a list of decisions. (Chair meetings)			
	6.14. Evaluate the importance of the outcome of consultations for the provision of primary care and reports to the general practice team. (Evaluate outcomes of consultations)			
Required competences	OrganizeAct responsiblyKnowledge and science			

7. Patient relationship and	information provision	
Description	Adapts practice management and information provision to the needs of the patient population.	
Learning outcomes	A GP student should be able to:	
	 7.5. Create an analyses of the composition of the general practice on the base of I.a. epidemiology, social-economic status (SES) and ethnicity. (Create analyses of the composition of the general practice) 7.6. Analyze how patients are informed about medical 	
	affairs/issues, procedures and organization of the general practice. (Analyze how patients are informed)	
	7.7. Orient on and uses the possibilities of social media and digital communication. (Use social media and digital communication)	
	7.8. Determine if adaptions in the providing of information are necessary based on the analysis mentioned in the previous bullet points and if so, which ones. (Determine if changes are needed in information provision)	
Required competences	 Collaboration Organize Professionalism 	

Appendix B: Business plan for conducting GPM



(Dijkers et al., 2011)

Appendix C: Interview expert 2

Expert 2 has graduated as a GP in 2008 and participated in a differentiation module on GPM during her educational program. She has been a general practice co-owner for the last six years. The goal of the interview was to gather information on the issues she encountered when she became a general practice owner and what is important for future general practice owners before starting or taking over one.

Expert 2 also agrees that the GP education program covers the right topics, however experienced several issues despite participating in the GPM module and being prepared for years by the previous general practice owner. She mentions most of them are small issues such as declaring consults and using the GP information system (HIS) properly. This is a trial and error process for the first few years, which is dealt with on the spot. There are however also bigger issues that had cost her a lot of time.

Firstly, she mentions the contracting process with the dominant healthcare insurance company, which is currently a hot topic due to the recent change in the funding model for GP care. This was a complicated process when she just started. The insurance companies offer healthcare tasks that align with the plans that the government defined for primary care and can be contracted by GPs. The insurance companies have set high demands for these healthcare tasks and often offer a small reward (money) in return. She mentions that on paper a GP can negotiate with insurance companies about the reward, but is not the case in reality. The insurance companies have a maximum reward for each healthcare task, which can't be negotiated about, while still having many demands that can be "vague".

As an example she refers to an elderly program she acquired two years ago to improve healthcare for elderly in her population. She had to hire somebody, create a plan and spend a lot of time on conducting the program due to the many demands. Looking back she is doubtful whether the program had much impact, despite spending many resources. She mentions that acquiring extra tasks affect her life/work balance and direct patient time, while getting little in return. The demands for these healthcare tasks are increasing each year, while the rewards decrease. This can of course be solved by hiring more staff to conducts these tasks such as a locum, however costs money and time that may not be available. She also mentions the importance of patients seeing the same GP as much as possible, otherwise it is impossible to provide decent care for them, which will decrease their satisfaction. For this reason she currently only acquired a few healthcare tasks this year such as basic care and integrated care for chronic diseases. She also refers to the "Het roer moet om" initiative.

Secondly, she mentions that staff management is one of the aspect of GPM she currently finds the most difficult. To be more specific leadership such as having an effective team and motivating staff.

Appendix D: Examples of algorithms for serious game





Appendix E: Evaluation

This evaluation concerns a serious game for teaching general practice management (GPM) and is called the "General Practice Manager". A serious game, is a game that is not primarily focused on entertainment and has the intention to teach the player, in this case GPM. The game simulates a virtual environment that depicts the general practice. The target audience of the game are GP students and recently graduated students that are interested in starting or taking over a general practice. The evaluation has been divided into three parts and lasts about one hour.

Intended learning outcomes

The first part of the evaluation focuses on what the serious game should teach the target audience when playing the game, which are called intended learning outcomes (ILOS).

1. If you could define <u>three</u> ILOS for such a serious game, taking into account the target audience, what would they be?

2. For our serious game, we have defined the following ILOS. Imagine that you have **24** coins to divide over the following ILOS to determine their importance. Taking this into account the target audience, please divide these coins.

#	Statement	How many coins?
1	A GP should be able to analyze the needs of the patient population.	
2	A GP should be able to select an adequate set of healthcare tasks	
3	A GP should be able to adequately hire staff.	
4	A GP should be able to delegate tasks among staff.	
5	A GP should be able to set out a strategy for the general practice.	
6	A GP should be able to understand financial management of a general practice.	
7	A GP should be able to respond adequately when internal and external events occur.	
8	A GP should be able to understand how managerial decisions influence the general practice.	

Walkthrough of the game

The second part of the evaluation focuses on a walkthrough of the serious game design, which has been implemented into a prototype. During this walkthrough, we will evaluate some of the game objectives and mechanics, including the criteria for decisions making.

Walkthrough – General Practice Manager					
Desired learning	A GP should be able to:				
outcome covered					
in this	• Set out a strategy for the general practice.				
walkthrough,	Analyze the needs of the patient population				
which reflect the	Select an adequate set of healthcare tasks				
real-world	Adequately hire staff.				
	Delegate tasks among staff				
Describe how	In the serious game, the player:				
game entities &	in the serious game, the player.				
babayiars man to	• Starts with a general practice from constabling a newly developed living				
subject domain	• Starts with a general practice from scratch in a newly developed living				
Subject-domain	area using a virtual environment. The player has a building with				
	equipment and is the only employee. Income is generated by				
	providing healthcare tasks and expenses are by paying for salaries and				
	 Is provided with population data that has been generated by the HIS 				
	or an external source such as the Supply, Demand and Analysis				
	Monitor (VAAM, screensnots A).				
	 Is provided with healthcare tasks from segment one, two and three 				
	that are offered by the dominant healthcare insurance company in				
	the region, for example Achmea (screenshots B).				
	Is provided with a job board with healthcare professionals looking for				
	a vacancies (screenshots C).				
	 Can delegate actions (tasks) to himself and other staff members 				
	(screenshots D).				
List actions	To provide population-based healthcare, the player should:				
required that are					
assumed to	1. Determine the needs of the patient population by analyzing the				
support learning	presented data (screenshots A).				
	2. Determine what healthcare tasks are available for the general				
	practice by analyzing the presented data (screenshots B).				
	3. Determine which staff members can be hired for the general practice				
	by analyzing the presented data (screenshots C).				
	4. Acquire and organize healthcare tasks that align with the needs of the				
	patient population.				
	5. Hire staff members that align with the needs of the patient				
	population.				
	6. Delegate actions (tasks) to himself and other staff members				
	(screenshots D).				
	This flow should allow the player to set out his own strategy for the general				
	practice.				

Questions

- 3. Do you think that "starting from scratch, being the only employee" is an adequate starting scenario for the target audience?
- 4. How do you analyze the needs of your patient population?
- 5. In case you did not have this information, how would you analyze the needs of your patient population?
- 6. Suppose that you are analyzing the needs of your patient population and you find out that a certain percentage (and number) of patients have a "high risk on anxiety or depression disorders". You compare this information to that of municipality and/or the country, and you find out that this specific health characteristic is higher in your area than that of the municipality and/or the country. Based on this criteria (screenshot A and B), would you select the POH-GGZ healthcare task?
- 7. Are there other criteria you would use for selecting healthcare tasks?
- 8. Suppose that you are analyzing the needs of your patient population and you find out that a certain percentage (and number) of patients have the Turkish nationality. You compare this information to that of municipality and/or the country, and you find out that this specific demographic is higher in your area than that of the municipality and/or the country. Based on this criteria (screenshots A and C), would you hire a staff member that also has the Turkish nationality?
- 9. Are there other criteria you would use for hiring staff members?
- 10. Suppose that you have task that requires a certain medical and/or management skill-level and you want to delegate to another staff member, for example to your DA. Moreover, you know the medical and management skill-level of your DA. Based on this criteria (screenshot D), would you delegate this task to your DA?
- 11. Are there other criteria you would use for delegating tasks?
- **12.** What do think of the overall concept of the game, i.e. providing population-based healthcare starting with S1 and ending with an events?

Feedback by Key Performance Indicators (KPIs)

The third part of the evaluation focuses on the qualitative and quantitative feedback players receive after playing the game. The feedback is based on the decisions players make during the game.

13. If you could define <u>three</u> KPIs for such a serious game, taking into account the target audience, what would they be?

14. For our serious game, we have defined the following KPIs. Imagine you have **15** coins to divide in total over the following KPIs to determine their importance. Taking this into account the target audience, please spend these coins.

#	КРІ	How many coins?
1	Reducing the cost per capita, i.e. reducing the costs for the	
	general practice, patients and government.	
2	Healthcare alignment, i.e. matching supply and demand.	
3	Patient satisfaction, i.e. how patients perceive care and	
	services.	
4	Employee satisfaction, i.e. how employees perceive working	
	at the general practice.	
5	Financial health, i.e. keeping the general practice financial	
	healthy.	

Questions

- 15. What is the **most important** factor that determines "reducing the cost per capita"?
- 16. What is the **most important** factor that determines "healthcare alignment"?
- 17. What is the most important factor that determines "patient satisfaction"?
- 18. What is the most important factor that determines "employee satisfaction"?
- 19. What is the most important factor that determines "financial health"?

Screenshots A - population

Anxiety and depression linked to POH-GGZ

Perceived health and disorders

Chronic diseases



Percieved health and high risk of anxiety or depression disorders

Nationality (non-western immigrants) linked to staff







Screenshots B – healthcare tasks

POH-GGZ healthcare task (service)

Task POH-GGZ

General information	
Name	POH-GGZ
Segment	1
Year	2015
Description	The POH-GGZ offers mental health support for the general practice
Requires	Staff * POH-GGZ
	Other * Equipment * Screening tool
Application date	Q1, Q2, Q3 and Q4
Contract duration start	2015
Contract duration end	2016
Reward	€ 2.80 - per registered patient € x.xx - depending on type of consult
Reward type	Consultation rates € 9,04 - Consult regular shorter than 20 minutes € 18,08 - Consult regular 20 minutes and longer € 13,56 - Visitation regular shorter than 20 minutes € 22,60 - Visitation regular 20 minutes and longer € 4,52 - Telephonic consult € 4,52 - E-mail consult € 9,04 - Group consult

Actions of the POH-GGZ healthcare task (service)

Actions					
Name	Time to perform action in hours	Time type	Assigned to	Assign to	
Create plan for POH-GGZ	8	other	Jan Strien - GP	Choose one 🔻	Save
Create office for POH-GGZ	16	other	Jan Strien - GP	Choose one 🔻	Save
Train POH-GGZ	24	other	Jan Strien - GP	Choose one 🔻	Save
Buy screening instrument software	4	other	Jan Strien - GP	Choose one 🔻	Save
Implement screening instrument software	4	other	Jan Strien - GP	Choose one 🔻	Save
Learn to how use screening instrument software	2	other	Jan Strien - GP	Choose one 🔻	Save
GP creates agreement with other GGZ care provider for consultation	8	indirect	Jan Strien - GP	Choose one 🔻	Save

Screenshots C – staff

Staff members

General practice owner	HIDHA	Doctor assistant	POH-GGZ	POH-S	GPM
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Jan Strien

General information	
Name	Jan Strien
Job title	GP
Gender	male
Age	35
Experience	junior
Nationality	Dutch
FTE	1.00
Salary per year	€ 100,000
Specialisation	none

Time division
Direct patient contact (37) 37
Indirect patient contact (11) 11
Other(11)
11

Screenshots D – Delegating actions (taken en actviteiten)

Delegating actions (tasks)

Action GP creates agreement with other GGZ care provider for consultation

General information				
Name	GP creates agreement with other GGZ care provider for consultation			
Management skill level	medium			
Healthcare skill level	medium			
Time	8			
Time type	indirect			
Assigned to	Jan Strien			
Assign to	Choose one Save Go back			

Screenshots E – Flow of the serious game

Flow

