The contribution of gamification to self-managing team performance

Application at ING Operational Services

Public Version



MSc Thesis of Aniek Berendsen
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The contribution of gamification to self-managing team performance

Application at ING Operational Services

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Public Version

For the degree of

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Executive Summary

Research Problem

In the business world of today, information technology is the key enabler for organizations to decentralize and therewith depart from the traditional command and control to new organizational models with more responsibilities for the workers at the bottom of the organization (Malone, 2004). Self-managing teams are special types of work teams who not only address the organizational challenges, but also take responsibility for the implementation and the outcomes (Robbines & Judge, 2009). By working with self-managing teams, organizations can benefit from the freedom, motivation, creativity and flexibility that drive small organizations as well as from the scale and knowledge efficiencies of large organizations (Malone, 2004). From a theoretical point of view, self-managing teams perform even better than traditional teams in terms of cost, productivity and quality improvements (Cohen & Bailey, 1997). However, practice shows that these teams are not easily implemented and that there are inconsistencies in the performances of self-managing teams. As organizational design theorists argue that organizations should move to more decentralized organizations with further delegation of tasks and responsibilities (Semler, 2015); (Malone, 2004) organizations are challenged to make people feel empowered and to give them the right kinds of insights and incentives to make decisions for themselves.

To enhance performances at work, gamification has become a trending topic which is attributable to its use as a strategic tool to motivate people for completion of their tasks, to reward people for their efforts and to give them feedback on the right task at the right moment (Singh, 2012); (Smith, 2011). Game and play have a long history of being used for not only amusement, but also being used for more serious purposes. From 1980 onwards researchers became interested in why games are so fun and absorbing and how game elements could be used for work activities (Malone, 1981). Although the idea of using game elements for serious purposes is not new, the term gamification was only defined in 2008 (Currier, 2008). In this research, gamification is considered as a system design practice and is defined as the design of motivational affordances supported by game elements to enhance performances in a group of interacting, interrelated, or interdependent social and technical elements forming a complex whole. Although gamification seems very promising to contribute to performances at work, state of the art research shows that there are still many unknowns regarding the definition, design, implementation and outcomes of gamification.

Relevance & Research Approach

The relevance of this research lies in intertwining these two trends of gamification and self-managing teams. Next to limited well-grounded studies on the effect of gamification, no research has been done to investigate how gamification contributes to self-managing team performance. The theoretical research objective of this research is to fill the void in theory regarding the contribution of gamification to self-managing team performance by analyzing the relation between motivational affordances and motivational needs. The practical research objective is to make recommendations to ING on the potential contribution of gamification to self-managing team performance and to develop and analyze a conceptual gamification design for self-managing teams. This research aims to answer the following research question central in this research: *"Which motivational affordances of a gamification design contribute to motivational needs in order to enhance self-managing team performance?"*

This research makes use of the design science research framework of Henver (2007). This framework is relevant and suitable for this research as it guides this research to focus on the design cycle for a gamified intervention, while requiring input from the self-managing teams via the relevance cycle and using the theoretical knowledge base of theories, research methodologies and expert expertise via the rigor cycle. The societal contributions will be of relevance for the self-managing teams whereas the theoretical contributions of this research will be grounded to the knowledge base.

Theoretical Background

Gamification is considered as a system design practice of motivational affordances (Deterding, 2014a), as it should take into account the inter-related design of a technical system, the set of rules that structure the behavior of people in the organization and the decision-making processes (Bots & Daalen, 2012). Motivational affordances refer to the actionable properties between an objects and an actor and comprise the properties of an object that determine whether and how it can support one's motivational needs. In this research, four motivational affordances are defined: compete (Reeves & Read, 2009), challenge (Csikszentmihalyi, 1990), empathize (Schell, 2008) and explore (Malone, 1981); (Schell, 2008). Another motivating element typical for game design is fantasy (Visch, et al., 2013); (Malone, 1981), which for this research is considered as part of empathizing in the game world. Motivational affordances are designed by the use of game elements, which are considered as the parts that a game exists of.

From the organizational studies it is deducted how to distinguish between groups and teams and subsequently how to distinguish self-managing teams from other types of teams (Robbines & Judge, 2009). A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems. Teams are more adaptable, productive and creative than individuals and therefore offer more innovative and comprehensive solutions to these organizational complexities (Salas, et al., 2005). Self-managing teams are a special type of teams, who also take responsibility for the implementation and the outcome (Robbines & Judge, 2009). The team outcomes are influenced by the task design, team composition, organizational context team processes, team norms and shared mental models (Cohen & Bailey, 1997). The self-managing team can be defined by the team demographics, maturity level, color print thinking or motivational triggers, the skillfulness and the perceptions of the self-managing team members in the self-managing team.

Research Methodology

To provide an understanding of the contribution of gamification to self-managing team performance, the theoretical insights are complemented with insights of a case study conducted at ING Operational Services. In the case study a mixed methods research design is used for which elements of quantitative and qualitative research approaches are combined (Johnson, et al., 2007). By combining quantitative and qualitative research methodologies in the research of the same phenomenon, the findings can be triangulated by which theoretical assumptions are challenged and a better understanding between theory and empirical findings is supported (Östlund, et al., 2011).

For the system analysis of self-managing teams' observations, performance measurements, a survey, semi-structured interviews with self-managing team members and the team manager are conducted. The quantitative results are used as a basis for interviews, in order to gain a better understanding of the complexities of self-managing teams. The gathered data is analyzed by means of functional modelling of tasks, a stakeholder analysis, an objectives analysis and a systems diagram to demarcate the system of interest (Enserink, et al., 2010). Based on these insights the need and relevance is determined of gamification as a mean to address the complexities of self-managing teams.

To research the contribution of gamification to self-managing team performances, a gamification design is required. The gamification design can either be an existing design or a new developed gamification design, depending on the complexities at hand. For this research, the choice is made to develop a new gamification design for which the gamification design process of Deterding (2014c) is followed. The design process prescribes five design steps of strategy, research, synthesis, ideation and prototyping. A multi-actor perspective is added to the strategy step in order to take the interest of the relevant stakeholders regarding the performances of self-managing teams into account. Furthermore, the steps of design verification and validation are added to the prototyping and therefore the design is discussed with a game expert.

The first gamified intervention is conducted to learn about the contribution of gamification to self-managing team performances and accordingly ideate promising design changes for a second gamification design and gamified intervention. In week 50 and 51 of 2014 one self-managing team worked with the gamified intervention, while another self-managing team was tracked as the control team. To gain a good understanding of the contribution of gamification, the quantitative findings of the performance measurements are triangulated with the qualitative findings of a focus group.

For the second gamification design changes are made based on the insights of the first gamified intervention. The second gamification design is validated with the COO of ING Operational Services and with the directors of Operational Services, Dagelijkse Bankzaken and Specials prior to its use in an intervention. The second gamified intervention was conducted in week 6 till week 10 in 2015. Both self-managing teams of the first gamified intervention participated as experimental group. No control group was assigned, as the performance data of the division was useful to benchmark the performances. The performances of the second gamified intervention are measured in terms of efficiency, quality, inventory control and job satisfaction. More insights in the contribution of gamification are gained by the motivational needs satisfaction measurement, an evaluation survey and focus groups with self-managing teams, team managers of Dagelijkse Bankzaken and the directors of Operational Services, Dagelijkse Bankzaken and Specials.

Case Study at ING Operational Services

The case study is conducted at ING Operational Services which is the centralized operations department of ING Domestic Bank, located in Leeuwarden in the Netherlands and which handles most of the day-to-day customer requests. They work with self-managing teams to make the organization flexible to adapt to fluctuations in their daily demand and realizing, in most cases, throughput times of one day while maintaining a high quality of their service. For the case study a system analysis and two gamified interventions are executed at a sub-division of Dagelijkse Bankzaken.

System Analysis

The system analysis of self-managing team at ING Operational Services shows that the self-managing teams work strongly with the principle of customer focused service and an inventory control management of today in today out. However, little attention is paid to the deployment and therefore the costs of this type of service. Self-managing teams are dependent of the daily inflow of customer requests and have to manage their tasks in such a way that they arrive at the target outcomes for efficiency, quality and inventory control. Although the performances are also influenced by the technical systems, institutional agreements and compliance regulations, this research focuses on the motivational needs of self-managing teams to arrive at the desired self-managing performances.

First Gamification Design

The first gamification design is focused on efficiency performance oriented self-management, designed for self-managing teams. The gamification design could also have been designed for team managers. By studying other examples, the idea was generated to develop an application in which the self-managing teams are running their own company. Accordingly the participating self-managing team brainstormed about a company for which they came up with their own coffee corner. The first gamification design is developed in a spreadsheet of the Microsoft Excel. The key activities to arrive at the performance targets of efficiency, quality of service and proper inventory control are translated by the metaphor of running your own company to the profitability of the company, the quality of coffee products, and the service of pending coffee orders.

As only the workflows with a set production norm contribute to the efficiency target, only these workflows are translated to coffee products. The norm per workflow is translated to a price per product, guaranteeing fixed revenues per hour no matter which workflows are executed. The other types of production are translated to cleaning tasks, with the idea that these tasks have to be done to sustain your business but which do not contribute to the profitability. The working hours are translated to personnel costs, for which the hourly wage is set according to the efficiency target of the particular self-managing team Accordingly, the self-

managing team got the challenge to become profitable each day and therewith balance their normalized production and working hours in such a way that they meet the target efficiency performance.

First Gamified Intervention

The results of the first gamified intervention are mainly based on rich qualitative insights, while being informed by the quantitative performance data. Quantitative data analysis of the performances showed that the self-managing team was mainly focused on processing more customer requests than balancing their working hours. In the focus group the self-managing team explained that in the first week of the gamified intervention they processed all customer requests that are on a monthly list to increase the revenues in the gamification design. This led to higher efficiency scores in the first week, but accordingly to a lower production in the second week and is not sustainable for the long term. Therefore, this was to be changed in the second gamification design. The findings form the qualitative analysis are that the gamification design was positively valued by the self-managing teams. The main perceived benefits were the transparency of contributing activities for their performance measurements, insights in their performance with respect to the targets and an enhanced communication within the self-managing team. The self-managing team indicated that they talked a lot more about their tasks and performances than before, which sometimes also led to some discussions and mutual competition. The main ideas for design changes were to improve the design of the four motivational affordances, to avoid mutual competition and to improve the fun and game feeling.

Second Gamification Design

The second gamification design is developed by revisiting all design steps of the gamification design process with the knowledge gained from the first gamification design and intervention. The main changes to the design were a technical design change, improved aesthesis and visualization, the design of each of the four motivational affordances and a scoring system not only focused on efficiency but also on customer satisfaction and continuous improvement. For the technical design, user forms were programmed by Visual Basic Application programming language instead of Microsoft Excel spreadsheet. This choice was made to improve the aesthetics and visualization and therewith create a more fun and game feeling for gamification design. A competition is designed between the 2 participating teams, which was set up for 10 day and the mutual competition within a team was removed from the design. Furthermore, the challenge is changed to not only making profit but also satisfying your customers. Also a price was added, for each day the team met the challenge they received a ticket for the lottery that was held at the end after 2 weeks of the gamified intervention. A lottery was chosen, as therewith all could be motivated for the chance of winning the price. The storyline was improved by which the self-managing teams received more feedback in the metaphor of their own customers and company performances. Lastly, more exploration was added by locked and unlocking elements in the screens and gradually more information about the price.

Second Gamified Intervention

The results of the second gamified intervention with two self-managing teams with different team characteristics show improved efficiency performance for both self-managing teams. The most increase in performance are shown by the most actively and the experienced self-managing team. However the new composed team underlines the potential use of the gamification design for new teams. It is concluded that the gamification design gives clear insights in the targets, the target activities, the bottlenecks and the progress with respect to the performances during the day. This is done in an easy and understandable way for which the aesthetics and visualizations are appealing. Both self-managing teams would recommend other self-managing team to start working with the gamification design as they argue that it mainly provided them with clear insights in their performance. Accordingly, some use cases are defined. New teams could use the basic version, by which in a fun and stimulating way a good understanding is gained, while experienced teams make use of the large variety of additional screens to improve their self-management. The involvement of the team manager depends on the involvement and understanding of the participating self-managing team. If they are actively involved and know how to work with it, the team manager could be on the sideline. Next to the use for efficiency purposes, the gamified intervention can also be used for other target outcomes as for instance a better quality of service.

Framework of Gamification Design for Self-Managing Teams

A theoretical framework is developed based on the findings from the literature study and the findings from the case study. This framework could serve as a starting point for others to analyze and design gamification for self-managing teams, or to build upon with further research. The framework presents the key relations between gamification and the performances of self-managing teams. To improve the performances of self-managing teams, first their performances and the motivational needs satisfaction of the team need to be analyzed. If there is potential for improvement and a lack of the feeling of either autonomy, competence or relatedness, gamification could be a suitable mean. Accordingly gamification is designed , by which motivational affordances can be created.

To contribute to target outcomes, a challenge and competition can be designed. Empathize enhances the understanding, communication and ambience in the team. Explore can be used to differentiate for different teams whereas new teams can work with the basic version and more experienced teams could use more functionalities of the gamification design. The design is evaluated with a gamification researcher, by which it is mentioned that the framework is very useful before the actual gamification design takes place. Therewith the use of the framework is mainly to analyze the organizational complexities and to determine the use for gamification and motivational affordances, whereas other frameworks and design processes from the game design field can be used to come to this specific design.

Main Findings

The aim of this research is to answer the central research question, which is as follows: *"Which motivational affordances of a gamification design contribute to motivational needs in order to enhance self-managing team performance?"*. This research presents a theoretical overview of gamification, concluding with the identification of four motivational affordances: compete, challenge, empathize and explore. Next, it is presented that to use gamification for self-managing teams, the motivational needs of autonomy, competence and relatedness should be satisfied. The characteristics of self-managing teams are explored and therewith the importance to acknowledged that a self-managing team exists of individual team members with different motivational triggers that contribute to an optimal team outcome. Therefore all four motivational affordances could be included in the gamification design to support the self-managing team performances.

In this research a working gamification system is developed to research the contribution of gamification to self-managing team performances. The results of two gamified interventions show that the gamification design contributes to self-managing team performances, mainly by providing the transparency in tasks and in the corporate performance measurements, next to improving the communication and ambience within in the participating self-managing team. The performances of two self-managing teams with different team characteristics both were increased in the second the gamified intervention and further analysis shows that the motivational affordances contribute to the perceived level of autonomy and competence.

The main findings are used to develop a framework for the analysis and design of gamification for self-managing teams. To determine the need for gamification in the real world, the performance and motivational needs of self-managing teams should be studied. Accordingly, motivational affordances can be created by gamification design, for which one's individual perceived level of autonomy, competence or relatedness can be enhanced. Depending on the team characteristics and the individual motivational triggers, there might be a preference for a particular motivational affordance. Lastly, the theoretical framework states that the enhanced motivational needs satisfaction of the individual is translated back to the real world by which the team performances are enhanced.

Theoretical & Societal Contributions

The theoretical contribution are the insights in the contribution of gamification to self-managing team performances by an analysis of the relation between motivational affordances and motivational needs. From a scientific point of view, there are many unknowns regarding the definition, design, implementation and

outcomes of gamification. Using self-managing teams as research objects of gamification has not been studied much before. This research gives presents the findings of an empirical study of the design and contribution of a gamified intervention for self-managing teams in order to enhance their performances and therewith addresses the theoretical knowledge gaps. These insights are summarized in a theoretical framework, that can be used to analyze the self-managing teams and to determine high level strategy for the use of gamification to enhance the performance of self-managing teams.

Considering the societal contribution, a practical solution is given for how to apply gamification in an organization. As organizations move to further decentralization and delegation of responsibilities and tasks, a practical solution is provided to how employees can be supported in their understanding of the broader goals so that they can interpret them for themselves and decide which activities to perform to achieve these goals. The gamification design is an gamified application that has been developed during this research and which is currently still in use at ING Operational Services to gain more insights and to explore if the needed investments will be made to bring the design to a higher level of development and integrate it with the existing systems in the organization.

Limitations

To value the contribution of this research, it is important to value the findings and contributions in the light of generalizability, methodological and theoretical limitations. To generalize the results and findings of this research, three limitations are identified. First of all, the small number of participants who were not randomly chosen limited the statistical power of the analysis and therewith the generalizability of the results. An experimental setup with more than 30 participants and control groups would be favorable. Second, due to the limited number of participating self-managing teams this research could not exclude other factors that might influence the effectiveness as the maturity level, group composition and tasks. In addition, although the teams are called self-managing teams, the degree of self-management may be a point of discussion. Thirdly, the influence of the organizational context might be researched.

Furthermore, four methodological limitations have been identified. First, the limited time span of the gamified intervention might have influenced the results. Second, the balance of the four motivational affordances in the design might not be equally valued due to difference in perceived motivational affordances by the user. Third, the application gives a lot of insights in the performances but it is stressed that it should only be used as a support tool and not as a control tool for higher management which might cause strategic behavior by the users. Fourth, a trade-off should be made regarding the question how specific or generic the application should be in order to optimally enhance the self-managing team performances and being usable for all types of self-managing teams within the organization. A specific application might address particular complexities while a more generic application is more easy for use in the whole organization.

Lastly, four theoretical limitations are identified. First, relevant findings from prior research may not be found due to parallel terms in the research field of gamification. Second, the relation between performances and job satisfaction is not researched extensively, although both might influence each other. Third, from a theoretical point of view four motivational affordances can be designed however this might not be true in practice. Fourth, gamification touches upon the ethical discussion, whether using game elements to 'make people' perform the desired behavior is ethical. Therewith, the gamification design should be designed and implemented with care.

Future Research

For future research five interesting directions are identified. First of all, it would be interesting to conduct the explanatory study with a greater sample size for an improved statistical power and generalizability of the findings. Therefore, a sample size of at least 30 participants is suggested. In addition, it would be interesting to set up an experimental design with control groups. Second, it would be interesting to include other factors in his research that might have influenced the effectiveness of self-managing teams. A more extensive study of the team composition and tasks could strengthen the findings. In addition, a third direction would be to research

the contribution to other types of teams. Therewith the effect of self-managing team characteristics could be determined and the framework could be generalized for teams in general than self-managing teams.

Also the influence of the organizational context could be researched, as a fourth direction for future research, in order to evaluate the influence of cultural and institutional aspects. A fifth direction for future research is to focus on the role of the team manager, instead of the self-managing teams. The team manager has a supportive role towards the self-managing team effectiveness, however the team manager does influence the effectiveness. As a team manager is confronted with targets, the supportive role might be conflicting with the tendency to command and control the achievement of the set targets. As gamification is a trending topic for researchers and the industry, it is expected that more knowledge will be developed in a relatively short term. Therefore, future research should use the new achieved insights by other researches in order to optimize the use of gamification for self-managing team effectiveness.

Abbreviations

CEGE	Core Elements of Game Experience
FTE	Fulltime equivalent; workweek of 36 hours
DBZ	Dagelijkse Bankzaken
ING	Internationale Nederlanden Groep
MDA	Mechanics, Dynamics, Aesthetics
[redacted]	
OEC	Operational Excellence Consultants
OS	Operational Services
PIAT	Productie in Aanwezige Tijd, production in netto deployed fte
S7	Super7, a nickname for self-managing teams at ING
SEPAM	Systems Engineering, Policy Analysis and Management
TITO	Today In, Today Out

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1. Introduction

For more than a decade researchers have theorized about how technology will change the shape of organizations. In the business world of today information technology is the key enabler for organizations to decentralize by which they depart from command and control to new organizational models where workers seek advice instead of approval and take the decisions themselves (Malone, 2004). Although there is not just one organizational model to turn to, as such the organizational models should always be customized and are much context-dependent (Bruijn, et al., 2014), increasingly attention is being paid to how organizations can quickly react to what is going on in the market and organization (Lanting, 2013). To remain competitive, organizations focus on lower costs, higher quality and increased throughput and a way to anticipate to this is to focus on a flexible and innovative organization in which more responsibility is given to the people in the organization (Lanting, 2013) and to turn to team-based working (Salas, et al., 2005).

Teams are more adaptable, productive and creative than individuals and therefore offer more complex, innovative and comprehensive solutions to the challenging situations that an organization may have to deal with (Salas, et al., 2005). Self-managing teams are a special type of team who also take responsibility for the implementation and the outcomes. Empowered by new technologies, organizations increase the ease of communication by which they can benefit from both the freedom, motivation, creativity and flexibility that drive small organizations as the scale and knowledge efficiencies of large organizations (Malone, 2004). The technological advances in communications enable people also in large organizations to achieve the information they need to make the decisions themselves, instead of just following orders from above (Malone, 2004). The organization should set out a strategy and the organization's objectives and should just let the employees themselves figure out how they can contribute to the bottom line of the organization, instead of telling them what to do (Malone, 2004); (Lanting, 2013).

Although this way of working and greater responsibilities for teams seem theoretically promising, in practice it turns out that teams are not easily implemented and require much more attention than just putting a team of skilled employees together and giving them tasks and responsibilities (Salas, et al., 2005). Organizations are challenged to create an organization where people feel empowered and have the right kinds of insights and incentives to make decisions for themselves (Malone, 2004). One means to achieve this, is to make use of gamification to make employees understand the broad goals which they can interpret for themselves and accordingly enables them to decide for their own situation how they help the organization to get there.

Game and play for serious work-related purposes were already used by Lenin in the mid-20th century (Nelson, 2012), but since 2008 the use of game elements for non-entertainment was framed as gamification (Currier, 2008). Gamification became a trending topic since 2010 as it caught the attention of both researchers and the industry (Hamari, et al., 2014). By means of game elements in a wide range of contexts, a fun and enjoyable spirit is created which engages and motivates the users to accomplish their work activities in such a way that it results in a reduction of costs, an increase of revenues, an acceleration of internal processes, an increase in data quality and increased user engagement (Hamari, et al., 2014). However the trend has resulted in a proliferation of definitions and with its numerous widespread applications (Deterding, et al., 2011) it seems that gamification is applied for each and every process or problem, although not always applied successfully.

Given the challenges organizations nowadays face and the potential gamification outcomes on one hand, gamification at the workplace seems very valuable (Smith, 2011). The relevance of this research lies in intertwining these two trends of gamification and self-managing teams, researching a gamified intervention as a means to enhance self-managing team performance. This calls into question how to define, design and deploy a gamified intervention successfully and to distinguish the complexities of this innovative form of working in order to research the contribution of gamification to enhance self-managing team performance.

1.1 Problem Definition

Gamification

While thinking about games and play, the first thoughts that come to mind are their traditional use for entertainment, i.e. the games that are played on the playground or around the kitchen table. Nonetheless, already in years B.C. games and play have been used for other, more serious purposes (Deterding, 2014b). But only in the early years of the 21th century the use of games and play for serious purposes has become a booming trend as it caught the attention of both researchers and marketers (Hamari, et al., 2014). This trend went along with a large variety of parallel terms, implementations, interpretations and oversimplification of the use of games and play in non-game contexts.

'Gamification' as a term was first documented in 2008 by Clay Shirky and Bret Terrill and became a widespread adopted term about two years later (Deterding, 2014b). For this research, gamification is considered as the use of game elements for non-entertainment purposes. Where game elements are defined as the overarching term for all parts that a game consist of, for instance elements of a game interface or the mechanics and dynamics as taking turns to make a move in a limited time frame. As a game element can support multiple motivational experiences (Deterding, 2014c), this research focuses on the motivational affordances created by gamification instead of the game elements of gamification.

While gamification became a widely accepted term, its interpretations and implementations began to involve very shallow interpretations and implementations as people seem to apply gamification for each and every problem. This made gamification in a number of cases a solution looking for a problem, obviously not bad for marketers but an undesirable situation for designers aimed at finding the best suitable mean to optimize a certain situation or to solve a specific problem (Deterding, 2014a). Aside from being called an easy to sell marketing miracle, gamification has been met a lot more criticism (Bogost, 2011). The criticism is primarily that games should be played for games' sake, being non-instrumental and having a proper place in the society that is free of order, purpose, norm and consequence (Deterding, 2014b). Proponents of gamification argue that even play at the playground is a place full of rules, social norms and expectations. Just think of the game spoiler or the bully to remind you of these rules and socials norms that count in 'free play' (Deterding, 2014b). Many critics rightfully question the definition and implementation of gamification and literature shows that gamification is still in its infancy. Despite these critical notes, the increased attention shows that there is a lot of interest in gamification and indicates that further research is relevant for both academics as the industry.

The frequently cited definition of gamification by Deterding, et al. (2011) "*Gamification is the use of game design elements in non-game contexts*" provides room for a wide range of applications to be framed as gamification. By definition, gamification intentionally makes use of elements from games, like points, badges, achievements or leaderboards, for non-entertainment purposes and is not to be confused with related concepts that make use of a full proper game. Hamari, Koivisto and Sarsa (2014) show the wide range of non-game contexts in their literature review of 24 studies on gamification, where the context is defined as the setting in which the gamified activities take place. The most common gamification context is education, followed by other contexts such as gamification of work, health, finance, sustainability, commerce and innovation (Hamari, et al., 2014); (Groh, 2012). For this research, gamification of work is to be studied in order to research gamification for enhancement of self-managing team performance. Hamari et al. (2014) state that the gamification context might be of influence on the measured gamification outcomes, although it is not known in what way and to what extent the context affects these outcomes.

The significant attention that gamification has gained is attributable to its use as a strategic tool to motivate people for completion of their tasks, to reward people for their efforts and to give them feedback on the right task at the right moment (Singh, 2012). Smith (2011) adds that gamification is also very useful for self-development, to influence behavior, to create awareness among organizational procedures, and to increase performance and productivity. This indicates that gamification seems very promising for use in organizations.

Gamification could create a reduction in costs, an increase in revenues, an acceleration of internal processes, an increase in data quality and an increased user engagement (Hamari, et al., 2014). Future trends, such as the blurred lines between work and life by the new way of working, the increasing diverse and distributed workforce (Smith, 2011) and the technology advances and expanding social platforms (Malone, 2004) show that there is potential for the integration of gamification at the workplace to get the work done and to get it done properly.

Although there is a common belief that gamification works and that the attention for gamification grew tremendously, a clear definition, a validated design process and academic evidence of the gamification outcomes are lacking. Attempts are made to come to a gamification design framework. Recently Deterding (2014c) developed a gamification design method, but also for this method empirical evaluation of its use and utility is lacking. In the same tone, many attempts were made to develop a framework for measuring the gamification outcomes, but unfortunately the results are barely comparable due to their great variety in methods, analysis, subjects and contexts (Hamari, Koivisto, & Sarsa, 2014). The many unknowns regarding the definition, design, implementation and outcomes of gamification make gamification and its application is an interesting topic to research.

Teams and Self-managing Teams

In contrast to gamification, there is a wealth of scientific knowledge regarding how to compose, manage, structure, measure and promote team performance. A team is defined as a collection of individuals, being interdependent in their tasks, sharing responsibility for their outcomes and who see themselves and are seen by others as an intact social entity embedded in one or more larger social systems (Cohen & Bailey, 1997). Research shows that teams are more adaptable, productive and creative than individuals and therefore offer more complex, innovative and comprehensive solutions to the complex situations that an organization may have to deal with (Salas, et al., 2005).

It is argued that more organizations should follow the movement of decentralization to remain competitive (Lanting, 2013). Decentralization and the allowance of employees at all levels in the organization to participate in the decision making that matter to them, are ways to stay innovative and flexible as an organization (Malone, 2004). A Dutch healthcare provider became more agile and effective by empowering workers of their operating core and accordingly cut out sixty percent of their management (Bruijn, et al., 2014) which illustrates that this way of working could also enhance cost reductions for management. Self-managing teams are special types of teams who not only address the organizational challenges, but also take responsibility for the implementation and the outcomes. Self-managing teams as a way of working was barely known around 1960 but nowadays it turns out to be a familiar way of working in organizations (Druskat & Wheeler, 2003) as it is argued that self-managing teams perform even better than traditional teams in teams of cost reductions, productivity and quality improvements (Cohen & Bailey, 1997).

This movement makes you question the role of the manager, if a self-managing team ought to manage itself. As it is argued that it is economically beneficial to give more power to more people throughout the organization (Malone, 2004), managers have an important challenge to deal with their power and influence. Working with self-managing teams requires a more supportive role of management instead of a traditional command and control leadership type (Druskat & Wheeler, 2003). Next to the role of management, it is interesting how self-managing teams will manage themselves as it is argued that becoming a successful team is not just as easy as putting a team of skilled people together (Salas, et al., 2005). However creating transparency on activities and responsibilities, facilitating knowledge sharing within large groups of employees and assist with finding focus for the team contributions to organizational goals can support the self-managing teams in effective self-management for a good team performance. This is where also gamification might come in, as gamification could function as a strategic tool for among others self-development and organizational awareness resulting in enhanced performance and productivity gains (Smith, 2011).

It is debatable whether gamification should be designed as a tool for managers or as an enabler for self-managing teams. Gamification could support management to gain insight in the self-managing team performance and additionally in the fulfilment of their managerial tasks. Self-managing teams could be supported in their work-related processes, to create awareness and insights as well as to motivate the team members to take certain actions resulting in better team performance. In both situations, gamification could be implemented as an intervention or as a general approach for self-managing teams.

Moreover it is interesting to determine if gamification can be designed to meet managerial goals as key performance indicators. Gamification has its main applications in marketing and service use in order to motivate and engage the users of a particular service (Hamari, et al., 2014). Hereby the subjects are mainly customers and to much lesser extent employees, though this distinction is not always clearly made. The two main studied outcomes of gamification are psychological outcomes as motivation, attitude and enjoyment and behavioral outcomes (Hamari, et al., 2014). Key performance indicators as productivity, effectiveness and efficiency are mainly valued as dependent variables of the psychological and behavioral outcomes. It would be interesting to study the gamification outcomes in terms the key performance indicators and to research the use of gamification to meet managerial goals and the job satisfaction of self-managing team members.

Practice shows that self-managing teams are not easily implemented and shows inconsistencies in their performances. Therefore it is interesting to distinguish what makes self-managing teams different from traditional teams and why organizations would implement self-managing teams. By studying the functioning of self-managing teams, complexities can be identified that self-managing teams may have to deal with and which limit their performance. By studying the functioning of self-managing teams, it can be determined if gamification is a suitable mean to enhance this performance. Although gamification seems promising, no previous studies are conducted on the effects of gamification on self-managing teams and therefore it is unknown in what way gamification could contribute to the self-managing team motivation and performance.

1.2 Motivation for this Research

The problem definition highlights the knowledge gaps regarding the application of gamification at the workplace, with respect to self-managing team performance. Next to *what* is interesting to know, it is meaningful to substantiate *why* it is interesting to perform research on it and to clarify the relevance of the insights to be gathered.

The first knowledge gaps capture the poorly defined concept of gamification. As gamification is not clearly defined, it is hard to distinguish what is gamification and what not. The fact that researchers use the same terminology for different concepts does not make it easier. In the wide spectrum of playful and gameful experiences, much more research has been conducted to playful and full-fledged games (Deterding, 2014c). From the wide range of contexts of gamification, the most studied context has been education (Hamari, et al., 2014). This research focuses on gameful experiences aimed at productivity at the workplace. First, because little is known about this research field. Second, because gamification of work seems very valuable to organizations, given the potential gamification outcomes and the aim of organizations to remain competitive while being challenged by new ways of working (Smith, 2011). Although the workplace is the studied context, this research' deliverables may be transferable to other contexts. Within this demarcation, playful experiences and full-fledges games are out of scope.

Literature on gamification shows that gamification is the use of game elements that create motivational affordances that satisfy the user's motivational needs (Deterding, 2014c) (Hamari, et al., 2014). Motivational affordances are the relational quality between the game elements and the user. A motivational affordance can be created by different game elements, therefore no one-to-one relation between a game element and the motivational effects can be found (Deterding, 2014c). For instance, a challenge can be supported by different game elements with challenging properties, like a high score list, a quest, a level or by a story line. Therefore, this research focuses on motivational affordances, supported by a variety of game elements that could create

motivational effects. The challenge could give the user a feeling of autonomy, competence or relatedness and in this way affect behavior, ideally resulting in better performance (Ryan & Deci, 2000a) (Hamari, et al., 2014).

The other knowledge gaps can be addressed once the concepts of gamification, motivational affordances and motivational needs are clarified. When a clear understanding of these concepts is gained, it is relevant to distinguish how gamification can be used to support self-managing teams in organizations. Theoretically self-managing teams seem promising for handling complex situations, while in practice it is not that easy to make a self-managing team successful (Bossche, 2006). Team performances are often complex, because teams are confronted with a set of interconnected complexities from the technology they are working with, due to rules that structure their behavior and due to the processes that have been developed over time. This research takes these aspects that could affect team performance into account, but focuses on the motivating aspects of the self-managing team members that could enhance their performance.

The motivation for this academic research can be concluded in scientific and societal relevance. From scientific point of view, gamification in itself is an interesting topic as there are many unknowns regarding its definition, design, implementation and outcomes. Using self-managing teams as research objects of gamification is interesting for academics, as this combination has not been studied much before. Insights in the building blocks and working of gamification are scientifically relevant as others could built upon these insights with further research with for instance other types of teams. Regarding the societal relevance, this research contributes to the quest of how to apply gamification in an organization and to gain insights in this potential contribution to the performance of self-managing teams.

1.3 Research Objective and Questions

Gamification is typically framed as the use of game elements outside game contexts, but as one game element can support multiple motivational experiences (Deterding, 2014c), this research focuses on motivational affordances in relation to the motivational needs of self-managing teams. Whereas satisfying motivational needs may affect behavior that contributes to performances (Ryan & Deci, 2000a).

The theoretical research objective is to fill the void in theory regarding the contribution of gamification to self-managing team performance by analyzing the relation between motivational affordances and motivational needs. Building upon the theoretical base, more insights are gathered by means of a case study with two self-managing teams of ING Operational Services. The practical research objective is to make recommendations to ING on the potential contribution of gamification to self-managing team performance and to show how a gamified intervention might look like by making an assessment of a designed gamified intervention for self-managing teams.

The research questions are developed by working in reserve from the theoretical and practical research objective, according to the methodology of Verschuren and Doorewaard (2010). From the research objectives, the intended results of this research are defined. The first intended results are insights in the contribution of gamification to self-managing team performance. The secondly practice oriented intended results are a designed gamified intervention for self-managing teams and recommendations on the contribution of gamification to self-managing team performance.

The insights and recommendations regarding the contribution of gamification to self-managing team performance could be gathered by analyzing a real-life case in terms of the organizations key performance indicators and the job satisfaction. By studying the results per self-managing team, the effect of differences in team composition could be explained. If performances have changed, it is interesting to research the contribution of gamification with respect to the team composition and characteristics. To gain more insights in the contribution of gamification to self-managing team performance, the relation between motivational affordances and motivational needs should be studied.

The research objects are self-managing teams, which are to be studied during a case study at ING Operational Services. The motivational needs are characteristic to the self-managing team members. By confronting the self-managing teams with the motivational affordances of the gamified intervention, the relation can be analysed. The motivational affordances can be defined by studying theories of gamification, motivational needs and self-managing teams. By preliminary research the theoretical insights found in the studied theories can be fine-tuned to be able to focus on what information is relevant and necessary for this research.

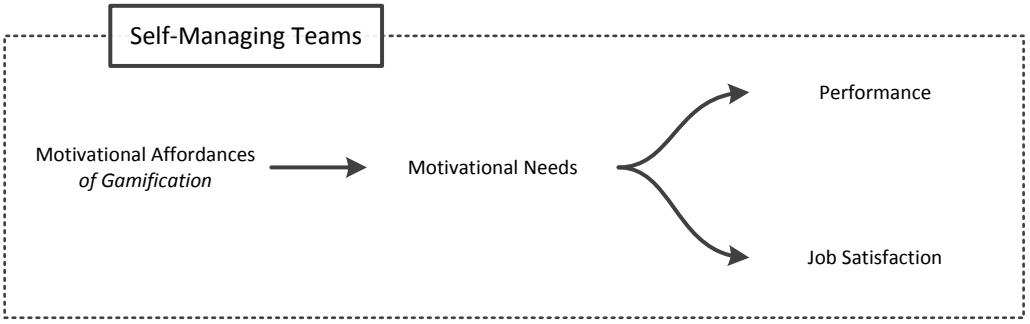


Figure 1 Key Research Concepts
defined according the Methodology of Verschuren & Doorewaard (2010)

The key research concepts of this research are visualized in figure 1. Theories of the game studies field and preliminary research result in the motivational affordances. Organizational studies are looked at to define the motivational needs and the characteristics of self-managing teams. The performance analysis and job satisfaction analysis should be evaluated and validated with respect to the composition and the characteristics of the self-managing teams. Research of these key concepts will results in final insights and recommendations for the use of gamification for self-managing team performance for both academics and ING.

These useful and necessary key concepts are addressed by the research questions that guide the research. In order to achieve both research objectives and to arrive at the desired insights and recommendations, a central research question is formulated:

"Which motivational affordances created by gamification contribute to motivational needs in order to enhance self-managing team performance?"

The central research question is unraveled into the following five sub-questions. For each sub-question, the expected deliverable is defined.

1. *What are motivational affordances and how are they created by gamification design?*
   Deliverable: Overview of motivational affordances, their characteristics and suitable game elements

2. *How could motivational affordances theoretically contribute to the motivational needs of self-managing teams in order to enhance their performances?*
   Deliverable: Prioritization of motivational affordances for self-managing teams

3. *How does a gamified intervention with motivational affordances for self-managing teams at ING Operational Services look like?*
   Deliverable: Two gamification designs for a gamified intervention at self-managing teams

4. *In what way can a gamified intervention contribute to the self-managing team performance at ING?*
   Deliverable: Gamification design evaluation, gamified intervention results and recommendations

5. *How can existing design frameworks be adjusted in order to develop a gamification design framework?*
   Deliverable: Framework for gamification design

1.4 Research Framework

To answer the research questions of this research, the design science research framework of Henver (2007) is chosen. This framework is relevant and suitable for this research as it guides this research to focus on the design cycle for a gamified intervention, while requiring input from the self-managing teams via the relevance cycle and using the theoretical knowledge base of methods from the system engineering practice and expert expertise via the rigor cycle.

The three cycle view of design science research is developed in the field of information systems and decision sciences, but is used in various engineering fields (Henver, 2007). Gamification is a socio-technical design practice, as it should take into account the inter-related design of a technical system, the set of rules that structure the behavior of people in the organization and the decision-making processes (Bots & Daalen, 2012). A structured way to arrive at a socio-technical systems design is to take into account the decision making processes of the people, the institutional systems and the technical systems of the organization (Koppenjan & Groenewegen, 2005).

Design science research can be just about potentiality, or in other words the identification of new opportunities to improve practice before any problem is recognized (Iivari, 2007). An overview of the design science research framework for this research is shown in figure 2. Design science research starts with the aim to improve the environment, for this research the aim of organizations to have high performing self-managing teams in order to remain competitive. Analyzing environment leads to identification of complexities and opportunities that the self-managing teams may have to deal with and accordingly to the requirements and constraints for the gamified intervention via the relevance cycle.

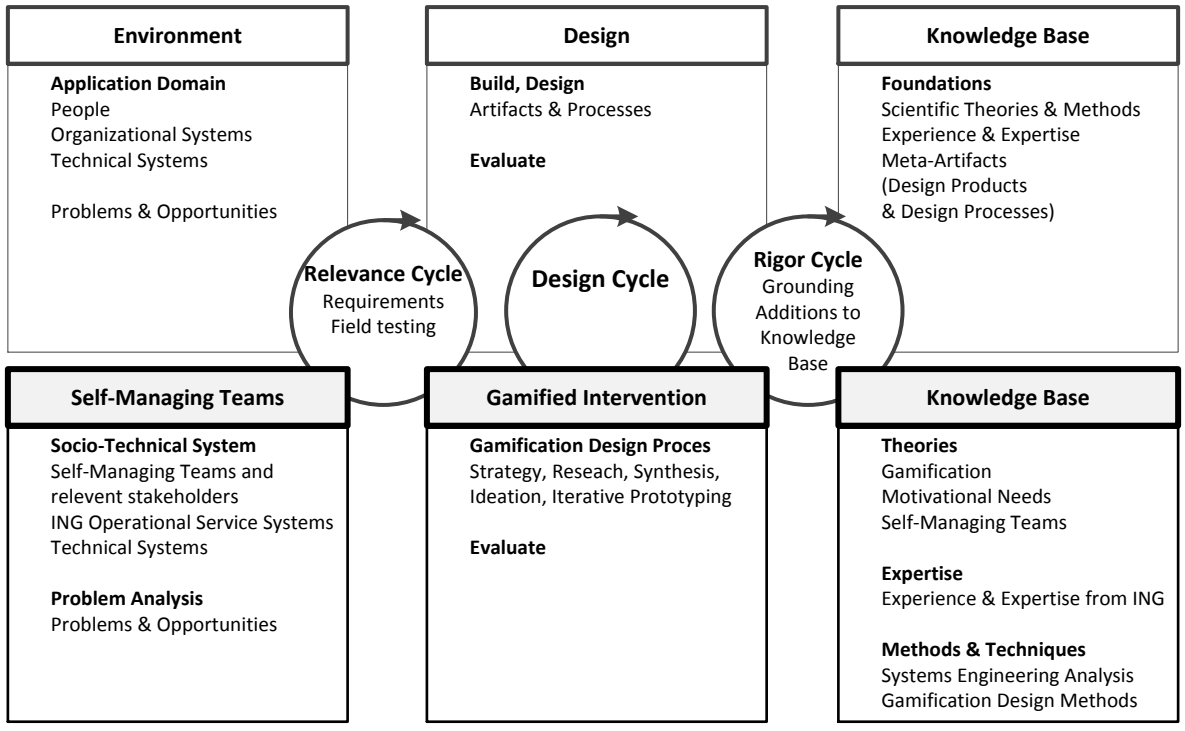


Figure 2 Design Science Research adapted from Henver (2007)

The designed gamification design will be a socio-technical design as it takes the self-managing teams and their relevant stakeholders, the engineered technical structure and the organizational context in which it is implemented into account to enhance self-managing team performances. To build and design the gamification design, the gamification design process of Deterding (2014c) specifies five steps to be taken in the design cycle: strategy, research, synthesis, ideation and iterative prototyping. The design cycle iterates until a satisfying

gamification design for self-managing teams is achieved, while paying attention to a good balance between the efforts spent to optimize the design and the improved performance of the design. The design makes use of the knowledge base via the rigor cycle and is tested via the relevance cycle.

The knowledge base for the gamification design will be formed in the rigor cycle, by studying theory on gamification, motivational needs and self-managing teams. In addition, expertise within ING is used by consulting self-managing teams, team members, higher management and operational excellence consultant of ING. The existing expertise contributes to the understanding of the functioning and performances of self-managing teams. Furthermore, methods and techniques from gamification design and systems engineering practice will be used to create insights for the design cycle. Lastly, the theoretical contributions of this research will be grounded to the knowledge base.

1.5 Research Methods

The design science research starts with the theoretical and societal research objectives to create new insights and to arrive at recommendations on the use of gamification to enhance self-managing team performance, next to determining how a gamified intervention might look like. The main research methods are literature research and a case study.

Literature research

A literature review is conducted to provide an overview of existing knowledge on gamification and self-managing teams and to determine the relevance of this research. The main insights for the first research question are gathered by conducting a literature research, in which the motivational affordances are identified which are supported by game elements. By prioritizing motivational affordances and accompanying game elements for self-managing teams on the basis of a literature research, also the main insights for the second research question are derived.

As a starting point for the literature research on gamification theories, first the research by Sebastian Deterding, a frequently cited user experience designer and researcher, is studied. In parallel, a literature review by Hamari, Koivisto & Sarsa (2014) is studied, as they selected 24 peer-reviewed empirical research papers on gamification for their review. The theory on gamification addresses the theory on motivational needs. The basic motivational needs are studied more in depth by the self-determination theory of Ryan & Deci (2000). The reference list and citations of these researches are analyzed for useful articles dating from 1970 to recent publications. Additionally, articles are gathered by means of searches in the online scientific databases. The open access articles preferably published in an international venue are selected on the basis of their relevance to this research. Articles are selected as the key source as they incorporate the most up to date information of these fields of research, next to frequently cited articles and books.

Secondly, literature research is conducted to capture the relevant knowledge on self-managing teams. First the book Super7 Operations by van Dijk (2013) on self-managing teams in financial services is studied. Subsequently the books Minds in Teams by Bossche (2006), Essential of Organizational Behavior by Robbines & Judge (2009), Structure in Fives: Designing Effective Organizations by Mintzberg (1993) and the Future of Work (Malone, 2004) are studied as these are books are frequently used in teaching organization and management. Interesting references in these books are selected, based on their relevance to the research.

From the literature research, knowledge gaps are identified. By means of a case study at ING Operational Services, an exploratory study is conducted to gather the relevant and necessary insights to answer the central research question. Literature is used to set up an empirical research design for an exploratory study and explanatory study. The research guidelines by Baarda & de Goede (2005); (2006) are used to set up the measurements. This book is basic literature in the educational programs and is used for its simplicity and practical use.

Case Study

By means of a case study insights are gathered by two gamified interventions with two self-managing teams during a gamified intervention of respectively two weeks and four weeks. On beforehand, by means of a system analysis of self-managing teams it is determined if gamification is a suitable mean for the complexities self-managing teams have to deal with. Accordingly, two gamified interventions are conducted, as some learning is expected during the first gamified intervention. To conduct a gamified intervention, first the third research question is addressed by determining how a gamification design for a gamified intervention at self-managing teams at ING Operational Services looks like.

Considering the time horizon of this research, the focus is on two gamified interventions at ING Operational Services. The results of the interventions are used to answer the fourth research question, which addresses the contribution of a gamified intervention to the self-managing team performance at ING. Furthermore the insights gained from the case study are relevant for evaluating the usability and utility of existing gamification design methods as little academic knowledge is available on a successful design process to come to a well-designed gamification design. These insights are used to answer the fifth research question and to arrive at a gamification design framework and recommendations for the use of gamification to enhance the self-managing team performance. Lastly, the insights of both the literature study and the case study are analyzed in order to answer the central research question and to arrive at the discussion of findings, conclusions and recommendations.

1.6 Research Structure

This introducing chapter describes which insights are interesting to acquire, why it is relevant from both the scientific and societal point of view to gain these insights and how these insights will be gained. The remainder of this report is organized as follows. Literature on gamification and self-managing teams serve as a theoretical starting point and is discussed in the second chapter. Game elements are identified that theoretically appear to be the most promising elements to contribute to self-managing team performance. These theoretically promising game elements to contribute to self-managing team performance are analyzed by means of a case study. The methodology used for design and analysis of the case study are described in detail in the third chapter. The theoretical base and the research methods together form the knowledge base for this research. Figure 3 illustrates the research structure and also provides an overview of the used research methods.

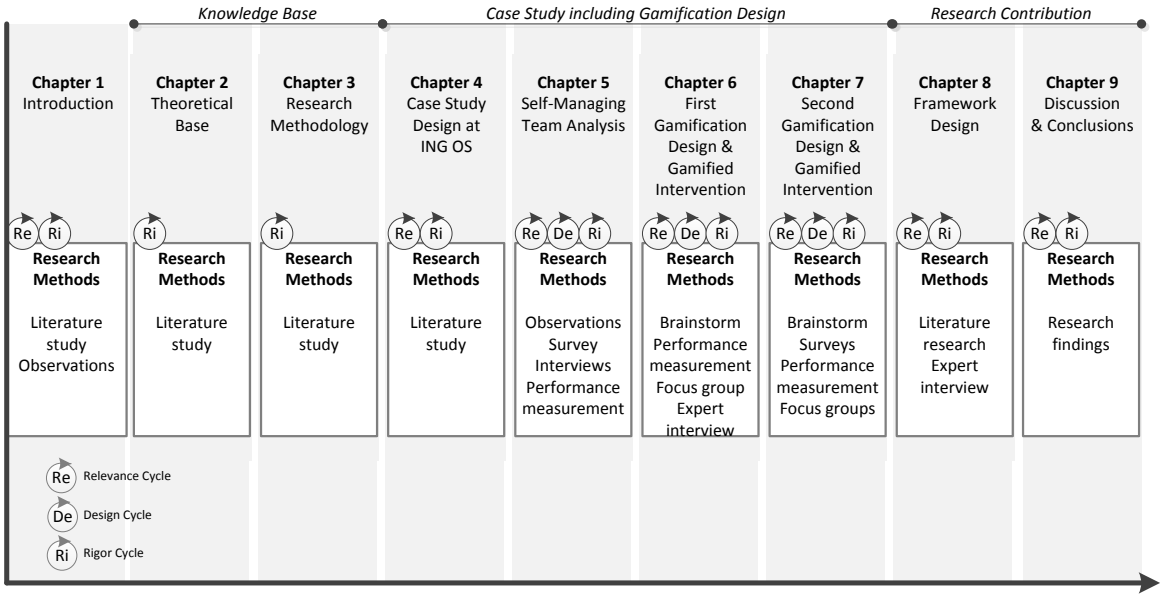


Figure 3 Report Structure

The case study executed at ING Operational Services is covered in the fourth till the seventh chapter. In the fourth chapter the case study design is explained, followed by the fifth chapter in which the self-managing teams are analyzed and the need for a gamification design is justified. Accordingly, two gamification designs are developed and analyzed by two subsequent gamified interventions as explained in chapter six and seven.

The acquired insights on gamification and self-managing team performance are, together with the existing literature, input for the development of a theoretical framework for gamification design. The framework design is explained in the eighth chapter.

The last chapter covers the main findings of the case study at ING, and discusses the validity and drawbacks of this research. Moreover, the conclusions in terms of theoretical and societal contributions are presented, including an implementation plan to embed gamification in an organization. The chapter concludes with suggestions for further research and a reflection on this research. Throughout the report references are made to appendices, which present more detailed or extra information. A part of the appendices is confidential, as these appendices cover sensitive information which is not public available.

2. Theoretical Base

The theoretical base serves as the starting point to research the contribution of motivational affordances supported by game elements to motivational needs, in order to enhance self-managing team performance. Literature research is used to come up with an overview of the motivational affordances and to prioritize them for self-managing teams.

First, a clear understanding of gamification and motivational affordances is gained. Second, the motivational needs are distinguished. Third, the characteristics of teams and self-managing teams are defined. The knowledge from these three fields are combined to arrive at an overview of motivational affordances and which seems promising to contribute to the motivational needs of self-managing teams in order to enhance their performance from a theoretical point of view.

2.1 Gamification and its Motivational Affordances

Literature shows that it is difficult to define what makes gamification work (Rojas, et al., 2013). To be able to apply gamification successfully, first a clear understanding of gamification is gained by looking at the rise of gamification and how it is distinctive from related concepts. Subsequently, gamification and its parts are defined and a gamification design process is chosen to arrive at a successful gamified socio-technical system for self-managing teams.

2.1.1 The Rise of Games for Serious Purposes

From 475 B.C. games began to be used for strategic planning and training for the military, first in China, and later on in the 19th century across whole Europe (Deterding, 2014b). The first use of games and play for work related activities date back to mid-20th century, where Lenin proposed 'socialist competition' among individual workers, groups and factories to increase production in the Soviet Union. Next to the gamification of work in the Soviet Union, the second major precursor is to be seen in the Americas where in the late 20th century a management trend emerged focusing on fun at work (Nelson, 2012).

In 1970, Abt states: "*Games may be played seriously or casually. We are concerned with serious games in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement. This does not mean that serious games are not, or should not be, entertaining*" (Abt, 1970). In 1981 Malone researched why computer games were so fun and absorbing and how these captivating elements of video games could be used in computer based learning. He studied the intrinsic motivation of players and developed a theory of intrinsic motivation based on three key elements: challenge, fantasy and curiosity (Malone, 1981). Back in 1982, Carroll and Thomas explained that psychological theories and methods could be used as basis for fun and enjoyable user interfaces. They argue that game mechanics can be applied as cover stories to make routine work activities more intrinsically interesting (Carroll & Thomas, 1982).

In 2008 one of the first blogged on a digital social gaming blog "*Gamification is coming to everything in the next few years. The next portal is a game. The next email is a game. The next social network is a game. Your next trip to the supermarket could be a game. Your next job could be a game. That means a lot of things, but for one, people with an understanding of those mechanics and how to create contexts will be highly valued. Second, gamification is just the beginning, and will continue for decades*" (Currier, 2008). In the early years of the 21th century, the use of games and play for serious purposes caught the attention of both researchers and marketers (Hamari, et al., 2014). This resulted in attempts to distinguish gamification from related concepts, to define gamification properly and to gain insight in the design and outcomes of the numerous applications.

2.1.2 Positioning Gamification

The definition of gamification as the use of game elements in non-gaming context (Deterding, et al., 2011) makes it hard to distinguish what is gamification and what is not. Over the last years, gamification became an

umbrella term for a wide range of concepts. The concepts being framed as gamification show a lot of differences among each other and a lot of parallels and overleaps with related concepts. To position these concepts on a scale, their degree of playful or gameful design and the level of game elements use to full-fledged games can be used. A categorization from Deterding (2011) is used a basis to position the relevant game concepts found in literature. Figure 4 gives an overview of the most relevant concepts and their relative position to one another. The orange dot presents where the gamification in this research can be placed on the continuum.

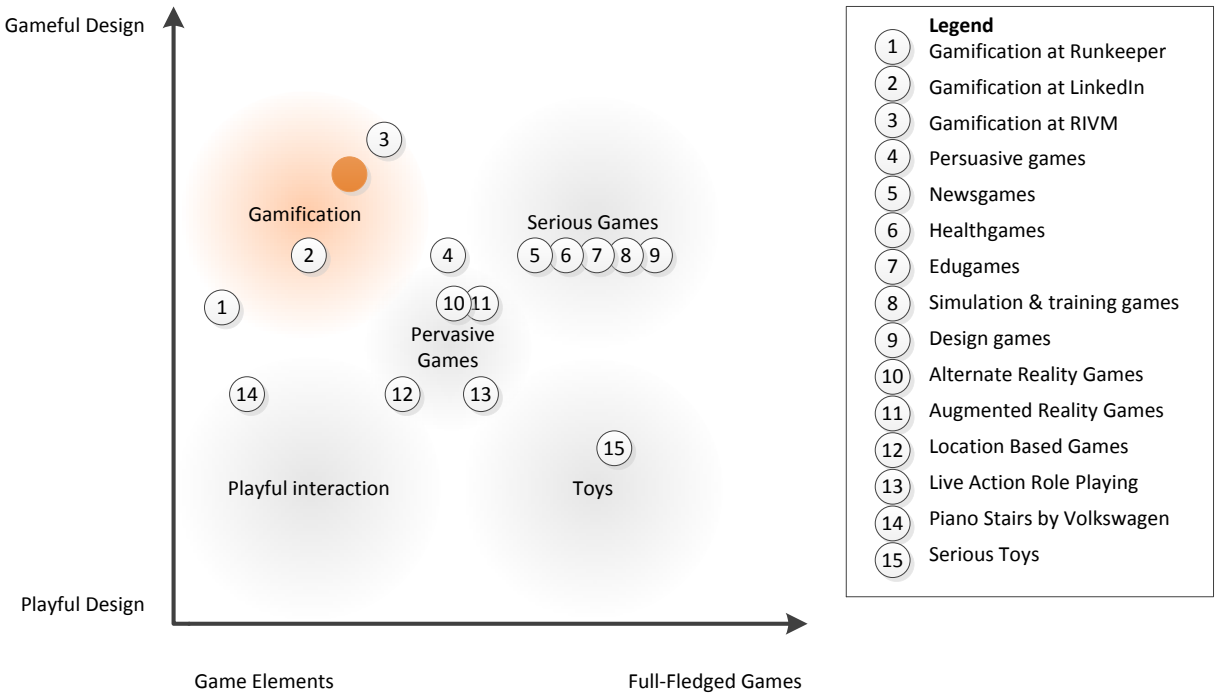


Figure 4 Gamification and Related Concepts

To understand the positioning of gamification and the related concepts, gameful design, playful design, game elements and full-fledged games are to be explained. The distinction in playfulness and gamefulness is introduced by McGonigal (2011). Gameful design denotes a playform structured by rules striving towards goals and discrete outcomes, whereas playful design captures a more free playform that is more improvisational, exploratory, expressive and looser (McGonigal, 2011). A gamification design should focus on gamefulness if clear goals and feedback are lacking, while a focus on playfulness is advised if curiosity, motivation and fun are missing (Deterding, 2014a). It is important to note that the focus on one design does not imply that the insights from the other design should be left out, but that it is useful to differentiate the related concepts (Deterding, 2014a).

Game elements can be found in many different types, within games but also outside of games (Deterding, et al., 2011). You may choose an avatar as your image that pops up when starting up the computer or you may be watching a progress bar while the computer is loading a program. Some game elements can be found in any game, while other game elements are unique to a certain type of game (Groh, 2012). Avatars and levels, for instance, are likely to be found in adventure games, but rare in real-time strategy games. There is a lot of room to discuss which elements should be included in the set of game elements. Including all elements that can be found in and outside games would make this set boundless, while restricting it to the unique elements of certain type of games would make this set very constrained (Groh, 2012). To define a set of game elements, it seems useful to focus on the elements that are characteristic to games, for which Deterding et al. (2011) suggest the description of game elements as "*elements that are found in most (but not necessarily all) games, readily associated with games, and found to play a significant role in gameplay.*"

Although gameful design and playful design as well as game elements and full-fledged games should be on each other's opposite site of the scale, the boundary between them can often be blurry (Deterding, et al., 2011). Gamification can be distinguished from related concepts by its use of game elements developed by gameful design rather the use of full-fledges games or being developed by playful design. While the focus of gamification is on gameful design, in practice gamification is often complementary to playful design (Groh, 2012). Additionally, gamification could make use of a few or many game elements, where there is a thin line between a gamified application existing of many game elements and a serious game existing of a full-fledged game (Deterding, et al., 2011). Three examples of gamification with a different level of game elements and gameful design can be found in the gamified applications of Runkeeper (Setola & Cramer, 2013), LinkedIn (Gamification, 2013) and the Dutch National Institute for Public Health and Environment (RIVM, 2014).

Related concepts are playful interactions, toys, serious games and pervasive games. Playful interactions and toys focus on free-form, expressive, improvisational behavior and meaning while gamification and serious games focus on rule-based playing with determined goals (Deterding, et al., 2011). An example of a playful interaction is an initiative of Volkswagen, who transformed the stairs in a metro station into piano stairs resulting in a significant rise in the number of people choosing the stairs over the escalator (Fun Theory, 2009). An example of serious toys is toys for children, as they learn about babies while playing with their quite realistic baby-born doll with 8 lifelike features. Focusing on gameful design, a closely related concept of gamification is serious gaming. Serious games differ from gamification, as this group of concepts consist of full-fledged games. Both serious games and gamification can be applied to numerous application fields, but the goals of serious game are mainly training goals, while gamification is more focused on increasing intrinsic motivation (Groh, 2012).

The last related concept is pervasive games. Pervasive games capture a quite new concept of games, by changing the characteristics of a regular game to be played in certain spaces at certain times by certain players. For pervasive games, the location is unclear or unlimited, there is no strict playing session but playing is mixed with the ordinary life and the players are undefined (Montola, 2005). Any person could unexpectedly change the gameplay as pervasive games encourage spontaneous interaction of unknown people and potentially motivate outsides to either join or be spectators of the public gameplay (Montola, 2005). Four examples of pervasive games of are alternate reality games, augmented reality games, location based games and live action role playing.

2.1.3 Defining Gamification

Although it can be substantiated that gamification does demarcate a distinct group of gamified concepts, the term gamification remains a heavily contested term. As the attention for gamification grew tremendously from 2010 on, it caught the attention of game designers, business people, marketers, media and a range of (potential) users. This created some friction towards the term gamification, as it brought together people from different disciplines and fields with different experiences, reference points and sometimes clashing opinions (Deterding, 2014b).

Gamification was in its initial phase around 2010 and at that time, the definition of Deterding et al. (2011) turned out to be a useful definition to begin with. There was in fact not much to start from for defining or applying gamification (Deterding, 2014a). This definition was a basis for reaching agreement about the term gamification and to substantiate its demarcation in relation to other established concepts. A second attempt to define gamification in its early stages was made by Huotari and Hamari (2011). They argued that gamification should be defined from a service marketing perspective of value creation and suggested the following definition: "*Gamification is a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation*" (Huotari & Hamari, 2011). Nowadays, both definitions are more or less outdated as next to criticism from other researchers, the authors themselves have also rethought their initial definitions (Deterding, 2014a); (Hamari, et al., 2014).

Despite the different definitions of gamification, recent research shows a tendency to move away from the focus on game elements (Werbach, 2014); (Deterding, 2014a), which resulted in the criticism as gamification being called an easy to sell marketing miracle (Bogost, 2011). Researchers move away from the focus on game element first, because there is no universal list of game elements, since it is impossible to clearly identify and distinguish game design elements from other design elements (Deterding, 2014c). Second, because it is recognized that the characteristic experiences for gameplay embrace more than just taking an activity and adding a layer of points, badges and leaderboards on top of it (Deterding, 2014a); (Werbach, 2014).

In recent research it is stressed that the focus should be on the positive and motivating experiences that emerge from the game elements (Hamari, et al., 2014) and on the process of how to make activities more game-like (Werbach, 2014). In the same line of reasoning, Deterding suggests: "*Expand the remit of gamification (1) from the structuring of objects to the framing of contexts, and (2) from game design elements to motivational affordances*" (Deterding, 2014a). Therewith gamification is considered as a socio-technical system design practice and is defined as the design of motivational affordances supported by game elements to enhance performances in a group of interacting, interrelated, or interdependent social and technical elements forming a complex whole.

2.1.4 Defining Motivational Affordances

As researchers use similar terminology for different phenomena in the field of gamification, also no univocal explanation for motivational affordances can be found. For instance, Hamari, Koivisto and Sarsa (2014) state: "*we collected and combined the different motivational affordances found in the studies into 10 different motivational affordance categories, based on the terminology used in the reviewed papers*", which is followed by an overview of these motivational affordances labelled as points, leaderboards, badges, etc. whereas Deterding states "*an affordance is not an objective feature of a design element, but a relational quality of both object and subject*" (Deterding, 2014b).

Given the ambiguity regarding motivational affordances found in literature, a clear definition is required for its use in this research. Affordances are used across a range of disciplines, for example psychology, industrial design, human-computer interaction, interaction design and artificial intelligence (Boys, 2011). Affordances are defined as the qualities of an object that enable people to undertake particular actions by which they may satisfy certain needs (Zhang, 2008). For gamification design, motivational affordances are applicable (Deterding, 2011b). Motivational affordances compromise the properties of an object that determine whether and how it can support one's motivational needs (Zhang, 2008). According to Deterding (2011b) motivational affordances transfer the well-established concept of affordances from perceived opportunities for action to questions of motivation and link it up with the needs satisfaction theory of motivation. In other words, motivational affordances emerge from game elements, are perceived by the user and may satisfy motivational needs for which the self-determination theory is applicable (Ryan & Deci, 2000a).

Visch, Vegt and Anderlessen developed a model to explain the use of gamification (2013). They state that people are struggling to satisfy their motivational needs in the real world. A game world is explicitly designed to fulfill those needs (Przybylski, et al., 2014). A game designer can use the real world as input for designing gamification and accordingly facilitate a game experience to the user. Figure 5 shows an adapted version of the model of Visch et al. (2013) of the real world and game world to which the motivational affordances created by a gamification design are added. As gamification makes use of game elements, gamification stays closer to the real world than full-fledged games like serious games. Therefore the transfer loops between the real world and the game world are smaller (Vegt, 2015).

Motivational affordances of a gamified design can be categorized in the four categories: compete, challenge, empathize and explore. The definition of these motivational affordances are derived from a variety of gamification studies in which the main motivational elements typical for gamification design are mentioned (Visch, et al., 2013); (Deterding, et al., 2011); (Zhang, 2008).

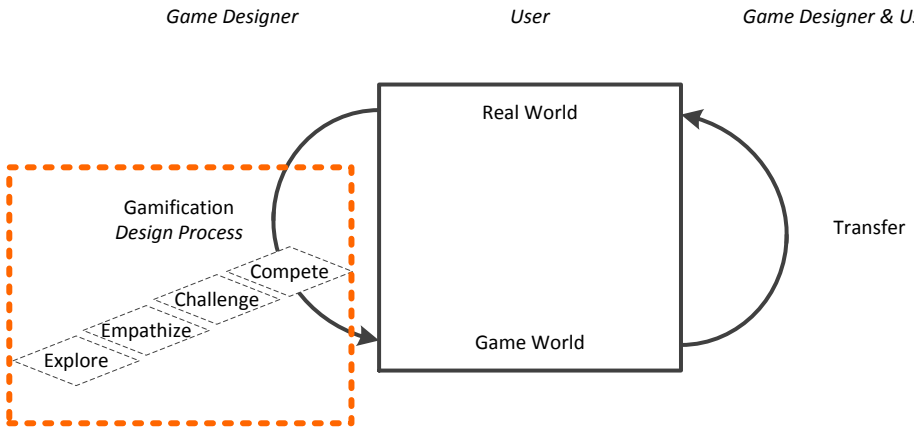


Figure 5 Research Focus on identified Motivational Affordances of Gamification adapted from Visch et al. (2013)

Competition is very common to games as most games are played to win, even though a range of intensity of competitive urges can be observed (Reeves & Read, 2009). Challenge could lead to individuals being more motivated and accordingly report more positive experiences in work, as shown in research to the optimal experience in work (Csikszentmihalyi, 1990). Although for the design of challenge a good balance must be found between the difficulty of an activity and the level of skillfulness over time as shown in figure 6. If the level of difficulty is too high, one might feel over-challenged. While maintaining the same level of difficulty too long, one may feel under-challenged. Therefore, the challenge should be increasing within the range of flow, which can be seen as continuous improvement of self-managing teams.

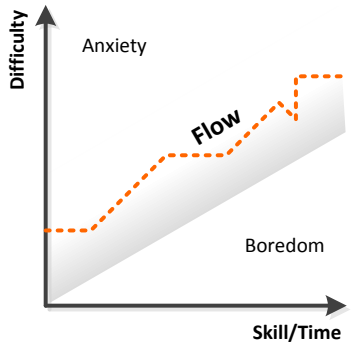


Figure 6 Flow Theory to Balance the Challenge adapted from Csikszentimihalyi & LeFre (1989)

Some researchers refer to fantasy as an important element for a motivating experience (Visch, et al., 2013); (Malone, 1981). However in this research fantasy is captured by the definition of empathize in the game world as empathy is seen as more distinctive from the other three motivational affordances. To empathize, a story line is very powerful to engage users (Schell, 2008) and research shows that storylines guide action and help to keep users engaged (Reeves & Read, 2009). Exploration is the last motivational affordance. Already in 1980, Malone states that curiosity influence behavior (Malone, 1981) and recent research confirms that surprise and problem solving are core in game design (Schell, 2008).

These four motivational affordances are more or less in line with the different player types as distinguished and widely used in game design (Bartle, 1996). Bartle describes the player types of killers, achievers, socializers and explorers. Whereby the primary pleasure of killers is competing and defeating others, for achievers this is challenge, for socializers' fellowships and relations with other people and lastly, explorers whose primary pleasure is discovery. As these simple taxonomies can hardly capture something as complex as the human

desire, this research is focused on gaining insight on how the different motivational affordances influence the motivational needs satisfaction of the players.

2.1.5 Defining Game Elements

Game elements are considered as the building blocks of the gamified design with actionable properties that the user interacts with. The game elements enable the users to take the desired actions in order to beat the competition, master the challenge, empathize with the story or to discover the unknown. In order to create motivational affordances, it is useful to have a clear understanding of the game elements to be used in a gamified design.

A game exist of elements, a theme, an interface, mechanics and dynamics (Schell, 2008), also categorized as mechanics, dynamics and aesthetics (Deterding, 2014a). According to the definitions, game elements interact with users through game mechanics and give rise to gameplay dynamics. Still, game elements are found on varying levels of abstraction as the boundaries between these categories are again blurry and still provide much room to discuss (Deterding, et al., 2011). Therefore, in this research game elements are defined as the overarching term for all parts that a game exists of. Deterding et al. specifies game elements at five levels of abstraction as shown in table 1. In this research, the first three levels of Deterding are defined as game elements, as indicated by the orange dots. As a game model, the motivational affordances of Compete, Challenge, Empathize and Explore are chosen. For the game design method a gamification design process is chosen, as explained in the next paragraph.

Table 1 Levels of Game Design Elements adapted from Deterding et al. (2011)

Level	Description	Example
Game interface, design patterns	Components and solutions of interaction design	Badge, leaderboard, level
Game design patterns, mechanics	Parts of design that concern gameplay	Time constraint, limited resources, turns
Game design principles, heuristics	Guidelines to approach and analyze a design	Enduring play, clear goals, variety of game styles
Game models	Conceptual models of game components or experience	MDA; challenge, fantasy, curiosity; game design atoms; CEGE
Game design methods	Game design practices and processes	Play testing, play centric design, value conscious game design

For each of the motivational affordances, game elements can be identified that are likely to be found. To compete, rules and leaderboards are essential (Reeves & Read, 2009). For challenge, clear goals and actions should be defined (Schell, 2008). To empathize, a narrative and interactive storytelling are the basic needs a masterful storyteller, who knows how to create a desire in the user's mind and known how to fulfil this desire (Schell, 2008). To explore, curiosity should be created and new information should become available (Malone, 1981); (Schell, 2008).

2.1.6 Gamification Design Methods

A metaphor borrowed from Reeves & Read (2009) is to see game elements as ingredients, for which you need a recipe and a cook to create a successful gamified socio-technical design. The recipe would be the game design method, prescribing the steps to be taken in the design process. As mentioned, gamification is still in its infancy and this also results in the presence of only a few well-established theoretical frameworks for gamification design (Hamari, et al., 2014); (Deterding, 2014c).

As there was not much to start from in the initial phase of gamification around 2010 (Deterding, 2014a), researchers used design frameworks from other research fields as a starting point. For designing serious games, a useful design framework is provided by Wenzler (2008). By this framework, four game components are

identified namely context, players, process and environment. For each component, dimensions and their ranges are defined. The framework is useful as inspiration for the design phase, to get insights from other disciplines to develop a gamified socio-technical system. The design framework of Wenzler mainly focuses on the game components, which is considered as only the first phase in another serious gaming framework of Peters et al. (2014). The framework of Peters et al. (2014) provides more useful guidelines for the entire design process, specified in the four phases of design specifications, system analysis, game design and game construction.

Next to the use of serious game frameworks, frameworks are adapted from game design (Schell, 2008) or even from the Medical Research Council (Rojas, et al., 2013) in order to have some guidelines to develop a complex gamified intervention that has the desired effect. Popular articles on the internet for the industry refer to the steps of Werbach & Hunter (2012) on how to gamify your business. They identify the following six steps: first define business objectives, second delineate target behaviors, third describe your players, fourth devise activity cycles, fifth don't forget the fun and lastly, sixth deploy an appropriate tool. To use these steps for an empirical research, they seem too general to provide sufficient guidance for the analysis, design and implementation of a gamified socio-technical system.

Furthermore, specific game design frameworks are developed. Geurts et al. (2007) focus on policy gaming for strategy and change. They state the game design process is not a design process for the client and argue that to the client this process is a process of interactive and systematic strategy development. Therefore they developed five categories of functions specified for policy gaming for strategy development. The five functions are complexity, communication, creativity, consensus and commitment to action. In their research they mainly focus on the anchor-points for each function in each phase of the game design process. The methodology by Geurts et al. may be useful as the focus is on strategy and change. However, their focus is more directed to the design of gaming-simulations and not specifically on the design of gamification.

For this research, the gamification design process of Deterding (2014c) is chosen as the overarching design methodology. First of all, because the design method is emerged from previous academic work and design methods in use in the industry. Second, because the design method is focused on designing in a socio-technical system, taking the technical and social aspects as a whole into account. Third, because it makes use of design lenses for game design, initially developed by Schell (Schell, 2008) that provide a design guideline that is inspiring and guiding without prescribing specific solutions. A fourth argument to follow this design method with the design lenses, is that by means of the skill atoms the analysis can be done and lenses can be selected that support the design for competition, challenge, empathize and explore.

2.2 Motivational Needs

This research aims to create insights in the contribution of gamification to self-managing team performances by analyzing the relation between motivational affordances and motivational needs. Next to the motivational affordances, a clear understanding should be gained of the motivational needs. First the types of motivation are explained, followed by an explanation of the three basic motivational needs.

2.2.1 Types of Motivation

Motivations have been widely studied. In general, motivation is defined as being energized and activated to do something and while being motivated people vary in their level and orientation of motivation (Ryan & Deci, 2000a). The level of motivation can range from very little to a lot of motivation. The orientation of motivation determines the why of actions. According to the self-determination theory of Ryan & Deci (1985) the most basic distinction in orientation of motivation are the types of intrinsic and extrinsic motivation. Intrinsic motivation refers to doing something because it is interesting or enjoyable, whereas extrinsic motivation refers to doing something because it results in a separable outcome (Ryan & Deci, 2000a). A classic example is learning, which for intrinsic motivation is done to acquire a new set of skills and for extrinsic motivation is done to gain a good grade for which you also might get some pocket money from your granny.

Extrinsic motivation is considered to be powerful but is typically valued as the 'bad' form of motivation. Kohn presents his study on the effects of rewards in his book "*Punished by rewards*" (1999), in which he explains that extrinsic motivation is less powerful than intrinsic motivation. Kohn studied a reward system which should make children draw more pictures, which resulted in more pictures, but of less quality and additionally, it made children not liking drawing anymore. Despite this typical view regarding extrinsic motivation, it is also argued that all behaviors are motivated by rewards, as for intrinsically motivation the reward is in the activity itself (Ryan & Deci, 2000a). The self-determination theory of Ryan & Deci (1985) states that there are different types of extrinsic motivation. Autonomy is considered as the underlying continuum of the different types of motivation (Weinstein, et al., 2012), where external regulation relates with the least autonomy and intrinsic motivation with the most. The different forms of motivation are illustrated in table 2, whereby the orange dots represent the focus for this research.

Table 2 Taxonomy of Human Motivation adapted from Ryan and Deci (2000a)

Types of Regulation	**A-Motivation**	**Extrinsic Motivation**				**Intrinsic Motivation**
		External Regulation	**Introjection**	**Identification**	**Integration**	
Associated Processes	Perceived non-contingency, low perceived competence, non-relevance, non-intentionality	Salience of extrinsic rewards or punishments, compliance or reactance	Ego involvement, focus on approval from self or others	Conscious valuing of activity, self-endorsement of goals	Hierarchical synthesis of goals, congruence	Interest, enjoyment, inherent satisfaction
Perceived Locus of Causality	Impersonal	External	Somewhat external	Somewhat internal	Internal	Internal

According to the taxonomy of Ryan and Deci (2000a), a-motivation is the result of not valuing an activity, not feeling competent to perform the activity and not having confidence that the activity will result in a desired outcome. External regulation is typical 'bad' form of motivation and occurs once an activity is performed to satisfy external demands or obtain external imposed rewards. Introjection motivates people as people try to avoid a feeling of guilt or anxiety, or try to obtain ego-enhancements or pride. Identification occurs if people identify themselves with the personal importance of the desired behavior and accept the regulation as their own, for instance people who accept to memorize vocabulary lists as they value it as important to learn a particular language. With integrated motivation the extrinsically motivated actions become more self-determined actions, the more one internalizes the reasons for action and assimilate them to oneself, the more the actions become self-determined. Completely self-determined actions are the actions that people are moved to by intrinsic motivations and that are inherently interesting or enjoyable.

A clear example in practice can be found in research by Ryan and Connell (1989), who researched the effect of four types of motivation, namely external, introjected, identified and intrinsic motivation. They researched the achievement behaviors for doing homework of students. They found that students being externally regulated, showed less interest, value, or effort and tended to blame others, such as the teacher, for negative outcomes. Furthermore, they found that introjection led to expending efforts but also more anxiety, poorer performance of activities with more failures. More positive results were achieved by identification and intrinsic motivation, whereas identification resulted in greater enjoyment and more positive performance of activities and intrinsic motivation related with interest, enjoyment, feeling of competence and also positive performance of activities.

Not all behaviors are inherently interesting and enjoying, only the activities that holds intrinsic interest for the individual. Therefore, this research aims at creating both extrinsic and intrinsic motivations by motivational affordances. The more people value the extrinsic motivations as important by themselves, the more they move to the characteristics of intrinsic motivation. Nevertheless, identification and integration stay extrinsic

motivations. The behavior is still done for the presumed instrumental value, to satisfy the management demands or obtain external imposed rewards despite the fact that people may recognize and value the behavior as important themselves (Ryan & Deci, 2000a). It is important to be aware that identification, integration and intrinsic motivation show similarities, but that they cannot be transformed into each other (Ryan & Deci, 2000a).

2.2.2 Autonomy, Competence and Relatedness

The environment can facilitate the intrinsic and extrinsic motivation by supporting the satisfaction of the motivational needs (Hamari, et al., 2014). Autonomy, competence and relatedness are considered as the innate, basic human needs as shown in figure 7 for which the definitions are borrowed from Ryan and Deci (2000a); (2000b). Autonomy refers to self-determination and volition as is defined as "*the organismic desire to self-organize experience and behavior and to have activity be concordant with one's integrated sense of self*". Competence, also referred to as self-efficacy, is defined as "*to be able to and to have the knowledge and skills to act effectively in a wide variety of situation*". Relatedness is defined as "*a sense of belongingness and connectedness to the persons, group, or culture disseminating a goal*".

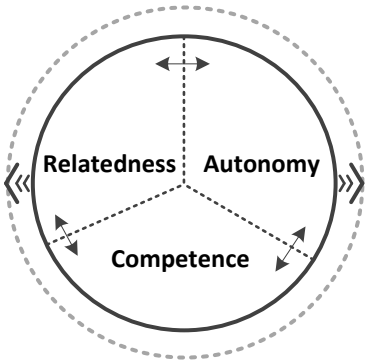


Figure 7 Motivational Need Satisfaction

For intrinsic motivation, one should experience perceived autonomy and competence (Ryan & Deci, 2000a). Previous research shows that satisfying the needs of autonomy results in more intrinsic motivation, curiosity and desire for challenge (Deci, et al., 1981). For the need of competence to enhance the intrinsic motivation for action, it should be accompanied by a feeling of autonomy (Ryan & Deci, 2000a). Intrinsic motivation exists in the relation between individuals and activities and by creating properties that focus on potential intrinsic interest, it lead to improved task performance.

Extrinsic motivation requires next to autonomy and competence the experience of perceived relatedness, as these activities do not hold intrinsic interest for the individual (Ryan & Deci, 2000a). For extrinsic motivation, previous research shows that satisfaction of the motivational needs lead to more engagement, better performance, decrease in dropping out, higher quality, and greater well-being among other outcomes (Ryan & Deci, 2000a).

Concluding that by fulfilling the motivational needs people can be stimulated to show behavior that influences performances positively (Ryan & Deci, 2000a). Self-managing team managers and operational excellence consultants indicate during the observations at ING Operational Services that mainly the external regulatory motivation and the identification for achievement behavior are visible at self-managing teams. Of course behavior is not the only way to improve performances. Therefore, the technical, institutional and social aspects of self-managing teams will be studied. In this research the current situation and the desired situation can be determined and accordingly the socio-technical system can facilitate for desired behavior of actors, given rise to by motivational affordances.

2.3 Self-managing Teams

By means of a gamification design, motivational affordances could satisfy the motivational needs of self-managing teams as that is where gamification designs may be designed for (Csikszentmihalyi, 1990). Gamification designs as an intervention for work activities are likely to address complexities that organizations may have to deal with (Oprescu, et al., 2014). For this research, the focus is on the complexities of self-managing teams in organizations. To be able to prioritize the motivational affordances in order of most promising to contribute to self-managing team performances, more theory is explored on the functioning and performances of self-managing teams.

2.3.1 Trend of Decentralization and Delegation of Tasks

Organizations are structured to identify their flows and to steer processes according to the organizational strategy. According to Mintzberg (1993) each organizational structure can be described by its five structured parts, its primary coordination mechanism and the situational factors. He distinguished five organizational structures, defined as a simple structure, a machine bureaucracy, a professional bureaucracy, a division structure and an adhocracy. De Bruijn et al. (2014) argue that there is no ideal organizational structure and stress that these structures are always customized, context-dependent and that the variety in practice is huge. However, it is known that organizations have been moving away from bureaucracy by focusing more and more on efficiency and effectiveness (Warmelink, 2011). Accordingly, organizations have restructured themselves to a more decentralized organization, in which working in teams have become extremely popular (Robbines & Judge, 2009).

Classical organizational design theorist Henry Mintzberg distinguishes the organizational parts of top management, middle management, operating core, techno structure and the supporting staff. Within a professional bureaucracy, the main part is the operating core (Mintzberg, 1993). With the core being the main basic part, the organization can be coordinated by means of different coordination mechanisms. These coordination mechanisms are in terms of increasing decentralization, direct supervision, standardization of work processes, standardization of outputs, standardization of skills and mutual adjustment. As an organization is more stable, standardization and therefore bureaucracy is likely to occur. Although the effective structure for an organization also depends on the age and size of the organization, the technical system of the operating core, various aspects of the environment and power relations within the organization (Mintzberg, 1993).

For more than a decade, organizational design theorists have theorized this movement to decentralization (Malone, 2004). The professional bureaucracy structure is a highly decentralized structure, both horizontally as vertically decentralized. The primary coordination mechanism in professional bureaucracies is standardization of skills. With that, the operating core has a significant degree of control over their own work. In general this means that the employee is relatively independent of his colleagues, but works closely with his clients. The norms or standards for the work are established in advance, mostly outside the professional's own structure (Mintzberg, 1993). By delegating work and responsibilities to the operating core, the employees are more incentivized to do their job well.

More recent research confirms the key element of decentralization of the organization in the future of work whereas decentralization is defined as "*the participation of people making the decisions that matter to them*" (Malone, 2004). In other words, it is about giving the employees in the organization more freedom whereas the level of freedom can range between loose hierarchies, democracies and markets (Malone, 2004). Loose hierarchies empower the employees at extremely low organizational levels, whereas democracies not only focus on the low-level employees but on all employees of an organization. Markets deal with the most extreme form of freedom and empower individuals to decide for themselves if an event adds value or not. To give people these kinds of freedom, employees should understand the higher organizational goals, should be able to interpret these goals for themselves and accordingly should have incentives to help the organizations to get there. An important note is that despite this freedom, remuneration and bonuses are in general still centrally controlled (Bruijn, et al., 2014). If organizations succeed to delegate tasks and responsibilities effectively,

organizations are likely to be able to quickly respond to changes in the industry and organization (Lanting, 2013).

This movement to more decentralized and more professional organizations provides more room for the professional and their own initiatives. However as mentioned earlier, there is no ideal organizational structure and therewith also decentralization may come along with some disadvantages (Bruijn, et al., 2014). First of all, this type of organizations mainly depends on the people of the organization. The movement to decentralization might also take away the safe and secure feeling that a hierarchy provides to their employees. Furthermore, the lack of management might create more competition among the employees in which they get the feeling that they have to prove themselves. Therewith this movement also refers to the classical model of a professional organization, in which the role for management was limited and the professional was in the lead.

Following decentralization while being aware of the advantages and disadvantages, the delegation of tasks and responsibilities are mostly assigned to teams of employees instead of to the individual as using teams turns out to be a better way to use employee talents (Robbines & Judge, 2009). Teams are not only capable of effective problem solving, they also have a huge impact on the employee motivation compared to traditional groupings (Bossche, 2006). Despite the beneficial effects of teams, teamwork also require increased communication demands, conflicts to be managed and more, so one should be aware that team work is not always the answer.

2.3.2 Positioning Self-managing Teams

To be able to distinguish self-managing teams from other types of teams, a clear understanding should be gained from the related types of teams. First of all, a team can be seen a particular type of group, whereas a group is two or more interacting and interdependent individuals, who come together to achieve particular objectives (Robbines & Judge, 2009). More specifically, a team in an organizational setting is defined as follows: *"A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems"* (Cohen & Bailey, 1997). The distinction between groups and teams is visualized in figure 8.

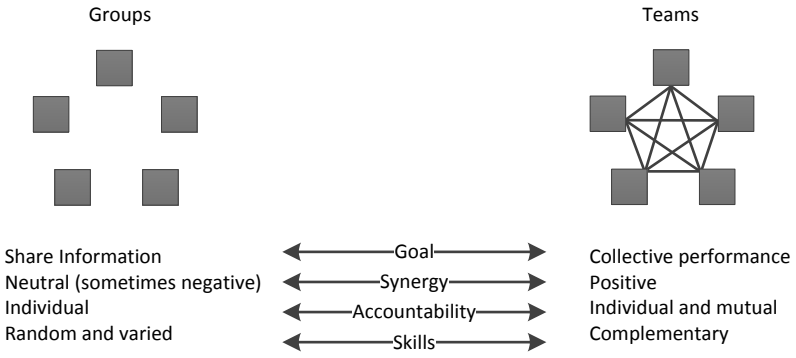


Figure 8 Groups and Teams adapted from Robbines & Judge (2009)

Within an organization four common types of teams can be distinguished, namely problem solving teams, self-managed teams, cross-functional teams and virtual teams as visualized in figure 9 (Robbines & Judge, 2009). Self-managed teams do not only solve problems, but they take also responsibility for the implementation and the outcomes. They are typically also responsible for planning, work scheduling, and division of work and with that they take on many responsibilities of their former managers (Robbines & Judge, 2009).

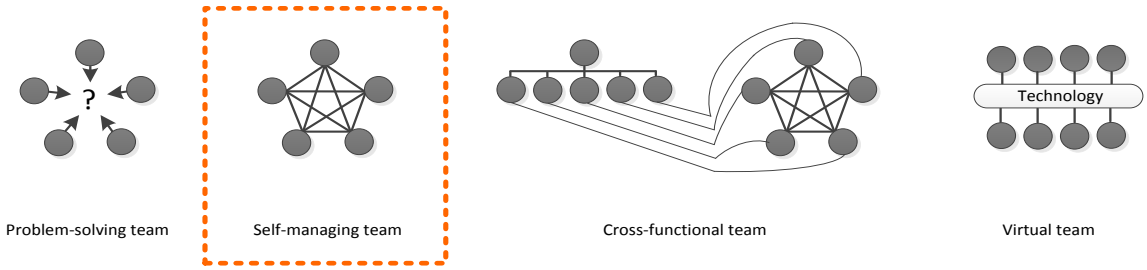


Figure 9 Types of Teams adapted from Robbines & Judge (2009)

Self-managing teams in general have motivational properties and facilitate higher employee motivation, but on the managerial goals they may even score worse on than individuals (Robbines & Judge, 2009). Therefore, one should be aware of the differences between work groups and work teams, and the different type of teams. Research shows an inconsistency in performances suggesting that the success largely depends on the teams' strengths, norms, type of tasks and reward structure. Each of these factors can significantly influence the self-managing team performances (Robbines & Judge, 2009).

2.3.2 Self-Managing Team Effectiveness

The model for team effectiveness by Cohen and Bailey (1997) presents team effectiveness as a function of environmental factors, organization design factors, tasks, group composition, internal processes as well as external processes and team psychosocial traits at visualized in figure 10. Therewith they show the effectiveness criteria for the performance, attitudinal and behavioral outcomes of teams. Performance outcomes include for instance efficiency, productivity, response times and quality. Attitudinal outcomes cover employee satisfaction and trust in management, whereas behavioral outcomes include absenteeism, turnover and safety.

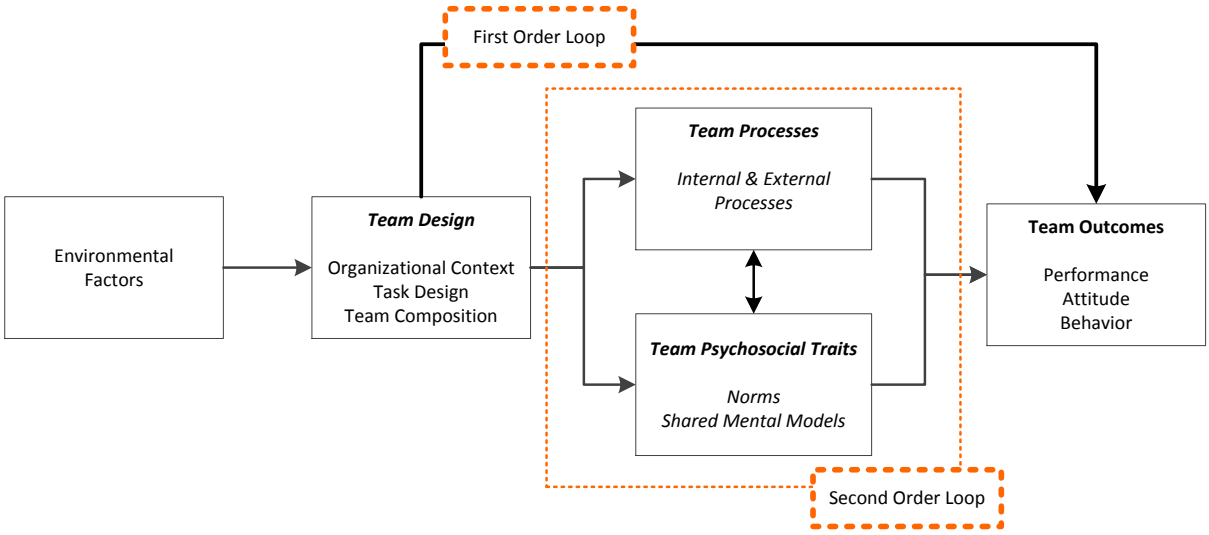


Figure 10 Team Effectiveness Model adapted from Cohen & Bailey (1997)

For this research, the first loop of interest is the loop from the team design to the outcomes with a focus on performance. According to this model, it is interesting to research the organization, the tasks and the team composition in order to contribute to the team outcomes. A second order loop however shows that decision making processes within teams are an important activity. To enhance the performances of self-managing teams by gamification, the gamification design should at least take the organizational context, task design, team composition and the decision making processes into account to address the identified first and second order loop to contribute to self-managing team performances.

2.3.3 Maturity Levels of Self-Managing Teams

Self-managing teams can differ in their maturity and therewith their level of self-steering. The more self-steering a team is, the more their interests allign with the interests of a team manager. A model of different stages of group development, created by Bruce W. Tuckman (1965) and revised by Tuckman and Mary Ann Conover Jensen (1977) presents the well-known stages of forming, storming, norming, performing and a later added fifth stage of adjourning. Within ING, four stages of maturity are distinguished based on the job tenure, organizational independence, cooperation, degree of goal and performance oriented and their level of team building. Table 3 provides an overview of these stages within ING. These stages can be used for the team design and task design, which are identified as important factors to influence self-managing team performance (Cohen & Bailey, 1997).

Table 3 Maturity Levels of Self-Managing Teams

	Stage 1 Forming	**Stage 2 Storming**	**Stage 3 Norming**	**Stage 4 Performing**
Job Tenure	Limited flexibility and task rotation. Focus on training	Desired level of flexibility is reached. Team members are employable at different workflows	Team members coach each other, train new employees and give feedback regarding executive activities	Desired performance level, focus on continuous improvement
Organizational Independence	Limited regulatory tasks are conducted. Less emphasis at this level	Executive tasks are expanded with control tasks and therewith more regulatory tasks are picked up	For effective functioning of the team, feedback is also provided on regulatory tasks. Personal and team development is promoted	Desired performance, focus on continuous improvement
Level of Cooperation	Basis need to be developed for task division and team roles	Smooth tasks rotation, commitment and responsibility to executive and regulatory work are shown. Team manager is still responsible for handling conflicts	Team members use each other's strengths and exploit them to improve team performance. Undesirable behavior and internal conflicts are discussed without the team manager	Desired performance level, focus on continuous improvement
Degree of Goal & Performance Oriented	Goals are set by team manager, attention should be paid to the acceptance by the team members	Team advises on team goals and production norms, they analyze their own performance and propose ways to improve it	Goals and standard are determined and team takes full responsibility for achieving performance levels	Desired performance level, focus on continuous improvement
Level of Team Building	Focus is on discovering each other's qualities, formulate mutual expectations and rules of conduct	As more skills are learned, a hierarchical order within the team should be avoided. The focus should be on equality and rotation of tasks	The growth of social maturity is often a difficult process. Therefore, teambuilding is devoted to learning about assessment and feedback	Desired performance level, focus on continuous improvement

2.3.4 Different Personality Types & Motivational Triggers

It is important to acknowledge that people are all different and with that, what motivates one person may demotivate the other. In order to motivate people, it is valuable to recognize the different motivational triggers and the different personality types that people may have (Dale, 2014). All kinds of attempts have been made to capture the complex human mind. From literature can be concluded that a simple classification of people cannot be scientifically substantiated, how bright, clear and instructive it may feel. While realizing a simple classification of people is not possible, personality traits are very helpful to describe people.

Big Five Theory

The most familiar and scientifically based psychological theory to describe and study different people is the big five theory (Raad & Doddema-Winsemius, 2006). This theory is based on empirical research by several independent researchers, who performed factor analyses resulting in five defined personality factors to

describe personalities. The five alternatives are openness, conscientiousness, extraversion, agreeableness and neuroticism (Raad & Doddema-Winsemius, 2006). To identify different personality types in order to couple these to different motivational triggers, this theory would be very useful. Due to high purchase costs to use this personality test, other feasible and affordable theories and accompanying tests are looked for.

Management Drivers Theory

Organizations may have committed themselves to a particular psychological test, for instance a human resource department may have purchased licenses of a specific psychological test. By making use of these licenses or the present results in an organization, conducting an extensive psychological test may become feasible. Although the present results may be very useful, one should be aware of the privacy and anonymity of the test results in an organization.

For this research, the availability and usability of psychological tests within ING were explored. ING makes use of the psychological theory of management drives for enhancing team performances. The theory is that understanding motivations helps us to cooperate, communicate and perform better. To understand what motivates people in their work, the theory distinguishes six profiles or management drives that can be tapped (Weerdt-Norder & Keijser, 2012). The associated test may be very useful, as the management drives can theoretically easily be linked to lean management. With knowledge and understanding of lean principles in relation to the management drives, communication and activities can be tailored for the achievement of better results in an organization (Weerdt-Norder & Keijser, 2012). Due to privacy, time and budgetary restrictions, this research does not make use of the management drives.

Print Thinking Theory

For this research, the print thinking theory of Léon de Caluwé (2004) is chosen because of its relevancy, availability, affordability and above all the known average scores of more than 4000 people on accompanying test (Caluwé, 2012); (Wesel, 2013). This theory defines five perspectives of print thinking to either create a change on an individual level, to enhance performances on team level or to strive for better organizational results on the organizational level. The different perspectives are yellow, blue, red, green and white print thinking and each color thinking has its common beliefs why something will change, by what it will change and where it will most likely result in. Table 4 illustrates the classification of people according to the print thinking theory. The print thinking theory is change oriented and by linking it to motivational affordances it can be helpful to describe different personalities and different motivations to change.

Table 4 Overview the Five Color Prints

Color Print Thinking	Conditions for change	Promising intervention	Most likely results	Pitfalls
Yellow Print	Bring interests together in a power game and create a *feasible solution*, mostly likely by a win-win situation	Form coalitions, change top structures, and policy making by facilitators who use their own power base who have a good sense for power balances and mediation. The focus is on positions and context	Partly unknown and shifting results, safeguarded by decision documents and power balances	Dreaming and possibility for also creating lose-lose situations
Blue Print	Think first, then act according to the plan. Follow a rational process towards the *best solution*	Project management, strategic analysis and auditing by experts in the field who have analytical and planning skills. The focus is on knowledge and results	Described and guaranteed results, safeguarded by benchmarking and other systems	Ignoring feelings, external and irrational aspects
Red Print	Stimulate people in the right way and create a *motivating solution*	Assessment, reward, social gathering and situational leadership by procedure experts who elicits involvement and who have HRM knowledge and motivational skills. The focus is on procedures and working climate	Outlined but not guaranteed results, safeguarded by HRM systems	Ignoring power games and intelligence
	Facilitate collective	Training and coaching, open systems	Envisioned but not	Excluding no-one,

Green Print	learning by a learning process to create *a solution that people develop themselves*	planning and gaming by facilitators who create settings for learning who have organizational development knowledge, feedback and skills. The focus is on the setting and communication	guaranteed results, safeguarded by a learning organization	ignoring that not everybody wants and is capable of learning, lack of action
White Print	Create space for spontaneous evolution by a dynamic process to create *a solution that gives energy*	Open space meetings, self-steering teams, appreciative inquiry by personalities who use their being as instrument who have an ability to discern and create new meaning. The focus is on patterns and persons	Unpredictable results on a practical level, safeguarded by self-management	Superficial understanding and laissez faire

2.4 Conclusions upon Theoretical Base

By means of the literature research a clear understanding of gamification and motivational affordances, motivational needs and the characteristics of teams and self-managing teams is gained. Gamification is considered as a socio-technical system design practice and is defined as the design of motivational affordances supported by game elements to enhance performances in a group of interacting, interrelated, or interdependent social and technical elements forming a complex whole. Motivational affordances refer to the motivating actionable properties between an objects and an actor, which may satisfy motivational needs. Compete, challenge, empathize and explore are the four defined motivational affordances which are used throughout this research. The motivational affordances are created by the use of game elements. In this research game elements are defined as the overarching term for all parts that a game exists of. To create competition, the game elements of rules and leaderboards should be included. For challenge, clear goals and actions should be used. To empathize, a narrative and interactive storytelling should be used in the design. Lastly, to explore, curiosity should be created and new information should become available over time.

Secondly, a gamification design can typically be designed to satisfy the motivational needs of self-managing teams. The three motivational needs are autonomy, competence and relatedness. The environment can facilitate the intrinsic and extrinsic motivation by supporting the satisfaction of the motivational needs (Hamari, et al., 2014). For intrinsic motivation, one should experience perceived autonomy and competence (Ryan & Deci, 2000a). Extrinsic motivation requires next to autonomy and competence the experience of perceived relatedness, as these activities do not hold intrinsic interest for the individual (Ryan & Deci, 2000a).

To determine which motivational affordances seem theoretically most promising to contribute to self-managing teams, the characteristics of self-managing teams are explored. *A* self-managing team is a special type of team, they are considered as a group of individuals who are interdependent in their tasks and also take responsibility for the implementation and the outcomes. Typically, they are also responsible for planning, work scheduling and division of work. Recent research confirms the trend of decentralization which is concerned with giving the employees in the organization more freedom (Malone, 2004). The maturity level of self-managing teams might be of influence on the level of freedom as to give people these kinds of freedom, employees should understand the higher organizational goals, should be able to interpret these goals for themselves and accordingly should have incentives to help the organizations to get there.

Furthermore, within the teams, it is important to acknowledge that the team consists of different people and that not everyone is triggered by the same affordance. Therefore, the color print thinking theory could be helpful to describe the different people in a self-managing team. As all people in a self-managing team are different, it is likely that all four motivational affordances will trigger someone in the self-managing team. Therefore, it might be useful to include all four motivational affordances. However, as self-managing teams are steered on output, it can be concluded that competition should be designed with care. Competition within the team might harm the self-managing team culture.

3. Research Methodology

The theoretical starting point in chapter 2 provides a reflection of the current body of existing knowledge relevant for this research. The research fields of game studies design and organizational studies and their intertwinement are explored. According to the design science research approach, the knowledge base is complemented with the relevant methods and techniques. This chapter elaborates on the used methodology for analyzing self-managing teams, designing two gamification designs and two gamified interventions in order to research the contribution of motivational affordances to the motivational needs of self-managing teams.

3.1 Exploratory and Explanatory Research

From the theoretical base, it can be deducted that it is likely that motivational affordances of gamification will enhance the effectiveness of self-managing teams. A competition, a challenge, empathy and an exploration could make people feel more motivated and therewith energized and activated to take the actions that lead to better self-managing team performance. However, the insights in this relation are too limited to formulate a grounded theory. Therefore more insights are gathered by exploring the contribution of gamification to self-managing teams. Subsequent to the exploration of the contribution, more extensive analysis will be done to explain the findings regarding the contribution of gamification to self-managing team performances.

To answer the question of which motivational affordances created by gamification contribute to the motivational needs of self-managing teams in order to enhance their effectiveness, a case study is conducted at ING Operational Services. A case study is a suitable mean to research the relations in depth and in a real-life context (Baarda & Goede, 2006). As the research fields of self-managing teams and gamification have not been combined extensively before, the gamified interventions will be of exploratory nature. Exploratory research is a suitable research type, as there are many open questions about the coherence or difference between the four defined different motivational affordances and the performance and job satisfaction of self-managing teams (Baarda & Goede, 2006).

The first gamified intervention aims primarily to learn about the application and contribution of gamification in an organization, in order to enhance the performances of self-managing teams. This type of research is a process of trial and error, in which ideas are crystallized, assumptions are adapted based on performances and relationships are reconsidered. Exploratory research is focused on learning and accordingly it is a research type that is less controllable, as it is common to be brief about all explorative steps and to mainly report on the identified relationships that give rise to further hypothesis development (Baarda & de Goede, 2011).

Based on the gained insights of the first gamified intervention, a second gamified intervention is designed. This gamified intervention builds upon the explorative results, but is also evaluative in nature. Extensive analysis will be done to explain the relationship between each of the four motivational affordances and each of the dependent motivational needs of autonomy, competence and relatedness, with respect to the performances. The findings of the exploratory and explanatory research in the gamified interventions will serve as a starting point for theory development regarding the contribution of gamification to self-managing team effectiveness.

3.2 Mixed Methods Research Design

In order to avoid the development of a theoretical relation between gamification and self-managing team effectiveness without testing it or to test the relationship without having a good understanding of the phenomenon, a mixed method research design is chosen for this research. A mixed method research is defined by Johnson (2007): *"Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration"*.

A methodological review of mixed research design shows a trend for conducting parallel quantitative and qualitative data analysis, as it capitalizes on the strengths of both quantitative and qualitative research methods (Östlund, et al., 2011). However, it is also noted that only a few studies clearly substantiate their choice for using this research design (Östlund, et al., 2011). The key purpose to mix quantitative and qualitative research is to gain more insights than what would be achieved by only analyzing the sum of the individual quantitative or qualitative parts (Bryman, 2007). Nonetheless, it is also argued by many practitioners of the mixed methods research that it is often hard to really integrate the findings of both research methods (Bryman, 2007).

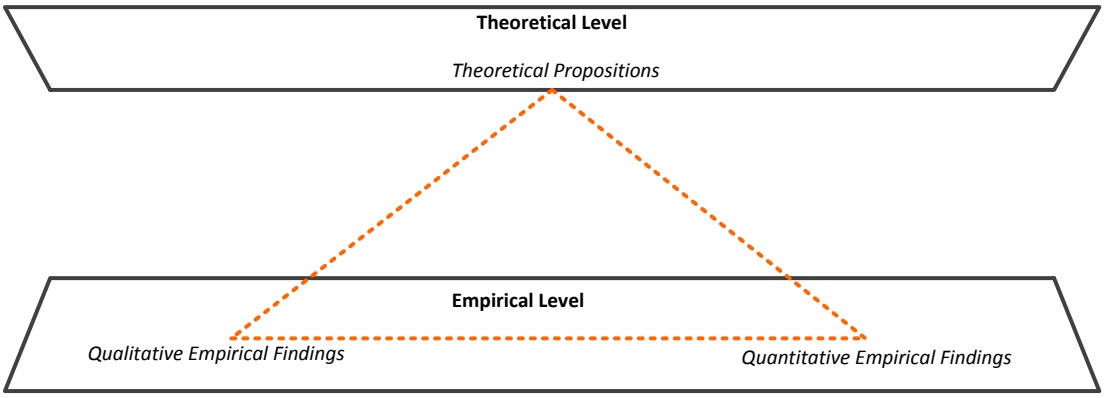


Figure 11 The Triangulation Triangle adapted from Erzberger and Kelle (2003)

Mixed methods research is based on triangulation, which is visualized by the triangle of Erzberger and Kelle (2003) in figure 11. Triangulation is the combination of methodologies in the study of the same phenomenon by which theoretical assumptions are challenged and a better understanding between theory and empirical findings is supported (Östlund, et al., 2011). The overarching term of mixed methods research covers different types of mixed methods research to be used for the broad purposes of breadth and depth of understanding and corroboration (Johnson, et al., 2007). These different types can be defined as either qualitative dominant, quantitative dominant or a mixed methods research of equal status.

In this research, a two-phase design of a mixed methods research is used as the basis (Tashakkori & Teddle, 2010) in which the system analysis is dominant qualitative, followed by the gamified intervention. However, as for this research two gamified intervention are executed, an extra phase is added to the design of the mixed methods research. The system analysis and the first gamified intervention are both dominant qualitative. The focus is on gathering a rich understanding by a qualitative study while being informed by quantitative data. The second gamified intervention is a dominant quantitative study for which the results are checked by qualitative analysis. The following terminology is used to define the research approach, whereas Qual stands for qualitative research, Quan stands for quantitative research and the use of capital letters denotes the dominant approach.

quan + QUAL → QUAN + qual

The following chapter will operationalize the research design, in order to determine the appropriate data gathering and data analysis methods for analyzing the relationship between gamification and self-managing team performances.

3.3 Methods to Analyze Self-managing Teams

To determine the complexities of self-managing teams, a system analysis is useful. A system analysis provides insights in the functioning of the self-managing team. Accordingly, it can be determined if gamification would be a suitable mean to address the identified complexities.

3.3.1 Methods to Gather Data about the Self-managing Teams

To gain insights in the functioning and performances of self-managing teams, data is gathered by means of observations, a survey, interviews and performance measurements.

Observations

Observations enable the researcher to describe the activities and behavior of the self-managing team members to manage their self-managing team performances. For the system analysis, two self-managing teams are observed during one day. The advantage of observations is that it allows the researcher to determine actual behavior. However, some disadvantages are that it does not allow for examining the motivations for the observed behavior and secondly, that it quite often asks for some interpretation which may have an adverse effect on reliability and thirdly, that the presence of the observer may influence the behavior of the observed team (Baarda & Goede, 2006). In order to overcome these issues, it is clarified beforehand to look for the main activities and behavior of the team members to manage their team performances. Moreover to enhance the reliability, the findings are verified during interviews with self-managing team members and the self-managing team manager. Another option to overcome the mentioned disadvantages would be to use hidden cameras, however for the purpose for this research this was not necessary.

Developed Survey

To enlarge the insights about the self-managing team functioning, a survey is developed, see Appendix A1. The survey is developed by making use of the team effectiveness model (Cohen & Bailey, 1997) which presents the team composition, task design and organizational context as important factors for team performance. To analyze the team composition, the color print thinking test is included in the first part of the survey (Caluwé, 2012). By using the color printing test, a simple classification can be made of the different motivational triggers of each employee in a self-managing team individually and on a team basis which may be helpful to describe the team composition. In addition to the color print thinking, the demographics are questioned as Koivisto and Hamari (2014) argue that there are demographic differences in the perceived benefits of gamification, whereas women are likely to experience greater benefits and the ease of use is likely to decline with age.

To gain insight in the task design, the workflows are questioned in the questionnaire. The respondents are asked to fill in their skillfulness per workflow to analyze who is able to perform which self-managing team activities. Furthermore questions regarding the type of contract, the desired number of working hours and the time employed within the organization and within the self-managing team are included. Next, the survey gathers data about the perceived level of autonomy, competence and relatedness in general, as the self-determination theory (Ryan & Deci, 2000b) argues that by fulfilling the motivational needs people can be stimulated to show behavior that influences performances positively (Ryan & Deci, 2000a). These questions are complemented with questions about the employees' motivation and enjoyment at work, as this is often addressed by gamification (Hamari, et al., 2014). Lastly, the personal objectives, knowledge about higher management objectives and insights in team performances are included as it is argued that the organization goals should be transparent to the users and that in order to motivate the user the gamification should be developed by a user-centered design instead of an organization-centered design (Nicholson, 2012).

Performance measurements

To measure the performance of self-managing teams, performance indicators are developed by considering the objectives of the self-managing team members, the self-managing team managers and higher management regarding the performances of self-managing teams, see Appendix CA3. From a preliminary interview with an operational excellence consultant regarding the performances of self-managing teams at ING Operational Services, see Appendix CA2, it is concluded that self-managing teams are much focused on the customer satisfaction and the today in today out processing of the customer requests. However, the efficiency of the working hours needed to deliver this service is often not taken into account.

The final developed performance indicators are the efficiency performance of self-managing teams, the quality of service and the inventory control of which the precise metrics are to be found in Appendix A3. According to the interference of operational excellence consultants at the self-managing teams, one of the key corporate

performance indicators at ING has also become efficiency. For efficiency, only the deployment for standardized production in the present working hours is looked at. Other utilization of working hours as non-standardized production, other production and regulatory tasks do not contribute to the efficiency target. The strategy of ING Operational Service is customer focused, they strive for optimal customer service and therewith error free processing of customer requests. The quality of work is measured by random quality checks for a number of workflows. Not all workflows are subject to quality checks, as some work activities are not controllable or are always double-checked for compliance reasons. In order to optimally serve the customer, the processes of ING Operational Services are designed to handle all incoming customer requests the same day. Therefore, their inventory control is focused on the today in, today out principle which accounts for all incoming requests up to 19h00.

At ING, a performance management tool Promise IV is used to gather the data of the number of client requests processed and the division of working hours among the different types of production, both per person and per self-managing team.

Semi-structured interviews

Subsequent to the survey, more detailed about opinions, perceptions and attitudes information is gathered by face to face interviews. Ten face to face interviews of approximately thirty minutes are conducted with six individual employees of one self-managing team, four employees of a second self-managing team and an interview session with the team manager and senior employee. The interviews are conducted to reflect on the findings of the observations, the survey, the performance measurements and to gain a more in depth understanding of self-managing teams. Interviews can be placed on a continuum of structure, from unstructured to semi-structured to highly structured. The continuum represents how much control the interviewer will have over the interaction. With unstructured interviews, the conversation may go in many directions and will vary much by the respondent. With structured interviews, there is a strict format of the questions to be asked in the same way for all interviewees. For this research, semi-structured interviews are conducted, in order to have a more flexible interview in which the self-managing team member can talk freely.

For all interviews, a guideline is developed with the topics to address during the interviews as shown in Appendix A2. The precise wording of the questions and the sequence in which the questions are asked may differ per interviewee. Each interview starts with an introduction of the context of the research and what the interviewee can expect from the interview. By means of the observation, an initial overview of the workflows and activities is made. This overview is the starting point of each interview, as it is a neutral topic to talk about and which is used to create an atmosphere in which the interviewee feels comfortable. The self-managing team member is asked to validate the overview and to identify potential bottlenecks for a high performance of their team. This may be a link to other questions, being the topics of perceived autonomy, competence, relatedness, enjoyment and motivation, as either their feeling of autonomy or competence may be a mentioned bottleneck for good performance. Next to the bottlenecks, the interviewee is asked where they excel in, as a team. Several example questions are included in the guideline, which may be used during the interview to gain a better understanding in the performances of self-managing teams and the relation with perceived level of autonomy, competence and relatedness. Each interview is closed by the question if there are any other businesses or remarks that the interviewee wants to share.

It is important to be aware of the potential drawbacks of an interview (Baarda, et al., 2005). First, people are not always aware of the motives of their behavior and therefore their information is not always valid. This can be avoided by focusing on facts and not on opinions. Secondly, people may take into account the social desirability of their answers. Thirdly, although it is time consuming, an oral interview is chosen above a written interview as it is suitable for many open and complex questions and it enables the researcher to control a complete data gathering.

The interview sessions are all held in Dutch, as this is the most convenient for all participants and the researcher to express themselves. The session is fully transcribed and anonymized in order to analyze them.

3.3.2 Methods to Analyze the Data

The data gathered from the observations, survey and interviews are analyzed in order to arrive at an overview of the functioning, activities and performance of self-managing teams and relevant stakeholders. The used methods and techniques for analysis are briefly explained. For this research, appropriate analysis and design methods mainly come from the systems engineering practice, as gamification is considered as a socio-technical design practice. From the analysis of self-managing teams it is concluded what the main complexities for self-managing teams are, how their performance could be enhanced and if gamification would be a suitable mean to meet these challenges and contribute to their performances.

The functional modelling method IDEF0

The main activities of self-managing team members are handling of workflows. The workflows of the two observed self-managing teams for the gamification intervention are described by means of IDEF-0 method. IDEF-0 is a method for analyzing and communicating the functional perspective of a system, by specifying the activities and the input, output, control and mechanisms of the activities on different levels (Honig & Kolfschoten, 2008). By analyzing the workflows, the activities performed by the self-managing teams can be identified that affect their performances. A more elaborate explanation of the IDEF-0 method is to be found in Appendix CA4. The data for the IDEF-0 diagrams are gathered by means of observations and validated and complemented during the interviews.

Stakeholder mapping

For this research, the stakeholder mapping method of Hillson & Simon (2007) is used as this mapping excels at taking the different aspects of attitude, power and interest into one graphic which gives a clear overview of the stakeholders. There are several models for stakeholder analysis, like a power-interest grid, the power-influence grid or a salience model with classes of stakeholders based on their power and resource dependency (Hillson & Simon, 2007). The used stakeholder mapping uses three axes of attitude, power and interest, each running from negative to positive extremes. For each combination of extremes, a 'personality' type is coupled, whereby each type of stakeholder can be approached by a separate strategy. The relevant stakeholders are identified during the observations and interviews and mapped from the viewpoint of the self-managing teams. By means of the stakeholder analysis, the most important stakeholders involved in the performance of the self-managing teams are identified. Accordingly, more insights are gathered in their interests by means of an objective analysis.

Objective analysis

To determine the desired performances of self-managing teams, the objectives the relevant stakeholders are analyzed. This is done by means of an objective analysis, according to the technique as described by Enserink et al. (Enserink, et al., 2010). By means of an objective analysis, higher goals can be operationalized by asking "What does it mean?". The lower decomposed objectives on their turn can lead back to a higher goal, by asking the question "Why would you want that?". The objective trees are a generalization of the goals as indicated in interviews with ten self-managing team members and their manager. Although these objectives are the result of observations of, and ten interviews with members of self-managing teams, they are still subjective and may change over time. Most importantly are the operationalized objectives which are the result of the objective analysis, as these are to be translated into criteria, or so-called performance indicators for the gamification design.

Systems diagram

A system diagram is used to summarize the systems demarcation by describing what is relevant for the system analysis of self-managing teams. The systems diagram describes four main categories, namely the criteria, external factors, means and internal factors (Enserink, et al., 2010). The criteria that are derived from the objective analysis are the indicators for the self-managing team performances. The external factors are the factors that do influence the self-managing team performances, but which cannot be influenced by the self-managing teams. The means are the four motivational affordances, which influence the self-managing team performances by the gamified intervention. Lastly, the internal factors are the motivational needs of autonomy,

competence and relatedness for which the relationship between the motivational affordances and performances are researched.

Data analysis
The data gathered by the survey and the performance measurements of self-managing teams are analyzed in order to gain a better understanding of the self-managing teams and their performance. From the survey the color print thinking profiles within a team are determined. These survey results are compared to the scores of thirty-three operational excellence consultants within ING and to the scores of four thousand randomized people from the Netherlands. The scores are compared to the consultants to determine if there is a difference between self-managing teams and other type of teams within ING. Furthermore, the survey results in an overview of the skillfulness per self-managing team and the division of expertise per workflow. A skill matrix reflects the maximum of training to be given within the team by their own self-managing team members in order to have full all-round trained employees in the self-managing team. The survey also provides a first indication about the perceived level of autonomy, competence and relatedness. Lastly, some statements can be made about the alignment of the personal goals and the organizational goals, the awareness of these goals and their knowledge and understanding about their performances.

The performances of self-managing teams are measured in terms of efficiency, quality of service and inventory control. The baseline performance is used to identify the opportunities for performance improvement by the gamified intervention and to score the performance during and after the gamified intervention. The data per team is compared to performances of 46 self-managing teams at Dagelijkse Bankzaken to benchmark the performances of the two participating self-managing teams against the other self-managing teams.

3.4 Method to Design a Gamified Intervention

To be able to research the contribution of gamification to self-managing team performances, a gamification design is required for the gamified intervention. The gamification design can either be an existing design or a new developed gamification design. For this research, the choice is made to design a gamification design from scratch as is substantiated by the system analysis of self-managing teams. The gamification design process of Deterding (2014c) is followed, as substantiated in paragraph 2.1.6. Deterding does prescribe the steps to be taken in the gamification design process, but he provides very little guidance on how to conduct these steps. The insights from the system analysis of self-managing teams are used as a basis for the design steps, in order to arrive at the desired outcome per design step of the gamification design process.

3.4.1 Gamification Design Process

For the gamification design, the design process of Deterding (2014c) is followed, as illustrated in figure 12. The design process prescribes five main steps for either the innovation or evaluation mode. For the first gamification design the innovation mode is followed, whereas for the second gamification design the evaluation mode is followed. The design process concludes with iterative prototyping. By building, playing and analyzing the prototype, changes could be made to improve the gamification design. According to the design process, these steps should be repeated until the desired prototype is achieved. However, a good balance should be made between the efforts to develop a new prototype and the incremental change in performance. Therefore, for this research two prototypes are developed. The first gamification design is used for the first gamified intervention. Accordingly the design is evaluated and promising design changes are ideated for the second gamification design.

According to Deterding (2014c), only the steps of build, play and analyze should be repeated. However, in this research also the preceding steps are revisited in order to arrive at a successful second gamified design. With the second prototype being the final prototype for this research, the analysis and evaluation of the second prototype results in recommendations for implementation. Although Deterding does not pay attention to the implementation, for this research a guideline is developed for embedding the gamified intervention and gamification in general in the organization.

Innovating Mode	*Evaluating Mode*
1. Strategy	
a. Define target outcome and metrics	
b. Define target users, context and activities	
c. Identify constraints and requirements	
2. Research	
a. Translate user activities into behavior chains (optional)	
b. Identify user needs, motivations, hurdles	
c. Determine gameful design fit	
3. Synthesis	
Formulate activity, challenge, motivation triplets for opportune activities or behaviors	Identify skill atoms of existing system for opportune activities or behaviors
4. Ideation	
a. Brainstorm ideas using innovation stems	a. Brainstorm ideas using design lenses
b. Prioritize ideas	
c. Storyboard concepts	
d. Evaluate and refine concept using design lenses (optional)	
5. Iterative prototyping	
a. Build prototype	
b. Playtest	
c. Analyze playtest results	
d. Ideate promising design changes	
Repeat steps a-d until desired outcome is achieved.	

Figure 12 Gamification Design Process adapted from Deterding (2014c)

Design Lenses

Deterding (2014c) refers to the use of design lenses for game design, initially developed by Schell (Schell, 2008). Skill atoms can be used for the analysis and lenses are selected to support the design for competition, challenge, empathize and explore. The design lenses for competition, cooperation, competition and cooperation and challenge are used. The design lens for storytelling is used in order to empathize. Last, the lens for curiosity, surprise and problem solving are used for exploration (Schell, 2008). Appendix A8 elaborates on each of these design lenses.

Brainstorm

A brainstorm is used for the ideation in step four of the design process. For the first case study, only the experimental group participates in a kick-off session of twenty minutes. All eight self-managing team members of this team are asked to join the ideation brainstorm. A group session is organized, as they might inspire each other and share the responsibility for the outcomes of the session. For the brainstorm, clear goals are set and questions are formulated to be asked the self-managing team members. The designer is the facilitator to introduce the goal of the brainstorm session, to keep the discussion on track and to make sure every participant is heard. During the brainstorm, the facilitator communicates the time left.

Focus Groups

Focus groups are used for the de-brief, evaluation and ideation of design changes, according to step five in the gamification design process. The choice is made to use focus groups instead of individual interviews, as the gamified intervention concerns the team and is also focused on team results instead of individual results. During a focus group self-managing team members may inspire each other, however it is also important to be aware of the fact that they also might influence each other in their opinion. The designer asks questions to the focus group, as first the gamified intervention is evaluated and accordingly design changes are proposed. The outcomes of the focus groups are also input for the second design cycle. For the second gamified intervention, the same procedure of a group brainstorm for the ideation in step four and focus groups for evaluation and ideation in step five of the gamification process is followed.

3.4.2 Gamification Design Verification and Validation

The gamification design is verified and validated. The design verification addresses the question *'Is the gamification design build right?,* whereas the design validation will address the question *'Is the right gamification design build?'*.

Design Verification
The verification is done in four steps. First, all state changes and variables are recorded and tracked of the gamified intervention. Second, it is tested if the gamified intervention can handle extreme inputs of one person. Third, the interaction of multiple persons is tested. This is done by first determining the individual and team parts of the gamified intervention, followed by testing the interaction moments. These steps are conducted for each individual sub part of the design. After verifying all sub parts, similar verification tests are conducted for the complete design but in a more structured manner. The fourth and last step of the verification is to test the entire gamified intervention with eight users.

Design Validation
In order to see if the build gamified intervention accurately addressed the challenges of self-managing teams, the design is validated. The validation is done in three ways, namely a historical replay, expert validations and literature comparison. The historic replay is done with present performance data, in order to determine if the design gives a realistic and the desired outcome if a day would have been expired as registered in the historical data. Of course, this is not exactly the same as if multiple people of a self-managing teams work with the design but it is very useful to test the design. Secondly, experts are used for validation. The self-managing team manager and operational excellence consultants are the important sources of expert information in this research. Therefore, the design and its content have been validated with them from time to time through unstructured interviews in the entire design process of this research. In addition, for the first study a serious gaming expert was consulted and for the second study a gamification expert. Lastly, literature on self-managing teams and gamification has been consulted during the design process. Literature on both individual research fields exists, but unfortunately note on the intertwinement of self-managing teams and gamification.

3.5 Methods to Research the Contribution of Gamification

By the previous paragraphs it is clarified how a better understanding is gained of the self-managing teams and how a gamified intervention can be designed. Accordingly, this paragraph explains how the contribution of the gamified intervention to the self-managing team performances is determined.

Motivational Needs Questionnaire
According to Deterding (2011b) the self-determination theory (Ryan & Deci, 2000a) can be linked to the contribution of motivational affordances created by gamification design. Hamari, Koivisto and Sarsa (2014) underline that the environment can facilitate the intrinsic and extrinsic motivation by supporting the satisfaction of the motivational needs. According to the self-determination theory one should experience perceived autonomy and competence for intrinsic motivation, whereas for extrinsic motivation also relatedness should be perceived (Ryan & Deci, 2000a).

The basic need satisfaction is a family of scales, as a scale for addressing the need satisfaction in general or others that address the need satisfaction in specific domains (Deci & Ryan, 1985). For this research, the basic need satisfaction at work scale is relevant as it is a standardized and validated questionnaire by it use in a variety of previous research (Deci, et al., 2001); (Ilardi, et al., 1993); (Kasser, et al., 1992). The questionnaire has twenty-one items concerning the three needs for competence, autonomy, and relatedness. The original questionnaire worked with a seven-point Likert-type scale. However for this research, the same questions but with a fifth-point Likert-type scale was used in order to align the questions from the motivational needs questionnaire with the job satisfaction questionnaire. Furthermore a ranking is added of the motivational affordances to the motivational need satisfaction. The final questionnaire is to be found in Appendix A5.

Job Satisfaction Questionnaire

It is argued that means to measure job satisfaction, always find that the employees are quite satisfied (Ferreira, 2009). An alternative for determining a job satisfaction value is to define types of job satisfaction and therefore avoid the instability of means to score the job satisfaction. The Zurich Model of Job Satisfaction is a model to analyze the significance of an aspiration level or perceived control of work situations and considers as a result job satisfaction (Bruggemann, et al., 1975). The Zurich Model of Job Satisfaction describes multiple forms of work satisfaction and dissatisfaction and the questionnaire was used for several empirical studies between 1990 and 2003 (Baumgartner & Urdis, 2006).

As the model has been developed some decennia ago, the model has been revisited over the years. For this research, the Zurich Model Revisited by Ferreira is used, as the revisited model also encloses a standardized and successive validated questionnaire to assess the multiple types of job satisfaction (Ferreira, 2009). The questionnaire questions the target and actual state comparisons of job situations and expectations as the perceived controllability, the increasing, maintaining, or decreasing aspiration level; and the attempts on problem solving. To ensure the quality and transferability of the job satisfaction measurements, this standardized questionnaire is used to score the job satisfaction before and after the gamification intervention. The job satisfaction questionnaire is to be found in Appendix A4.

Evaluation Survey

To evaluate the second gamification design and the gamified intervention, a survey is developed as shown in Appendix A5. The survey is developed to evaluate the usability, usefulness and potential usefulness. Special attention is paid to the motivational affordances of the gamification design. The survey results are used as basis for the evaluation session with both self-managing teams by which qualitative information could be gathered. For the survey, 24 items are developed to evaluate the usability, usefulness and potential usefulness. Next to these 24 items, 5 open questions are added to gain a better understanding of their responses.

Focus Groups

The second gamification design and gamified intervention is evaluated throughout the whole organization of ING Operational Services by means of four focus groups: the first experimental group, the second experimental group, the managers of Dagelijkse Bankzaken and the management of Operational Services. In the focus groups the second gamification design is presented. Accordingly a discussion is started to evaluate the design and to gain more insight in specific design parts. The sessions are all held in Dutch, as this was most convenient for all participants and the researcher to express themselves. The session is fully transcribed and anonymized, see Appendix CA12.

4. Case Study Design at ING Operational Services

To research the contribution of gamification to self-managing team performance, quantitative and qualitative research methods are used in the case study at ING Operational Services. To conduct the case study, first the self-managing teams are analyzed. Accordingly, the first gamification design is developed and used in a gamified intervention. The insights of the first gamified intervention are used to revise the gamification design and to perform a more extensive analysis during a second gamified intervention. This chapter covers the research set-up for the system analysis and both gamified interventions by describing the participants, procedure, measurement methods and expected results of both gamified interventions.

4.1 Research Set-up System Analysis

The system analysis is conducted for the self-managing teams of division Dagelijkse Bankzaken of Operational Services preceding the first gamified intervention. In order to gain a good understanding of the complexities of self-managing teams and to justify the need for a gamified intervention, quantitative and qualitative data analysis is conducted. Dagelijkse Bankzaken and the two participating self-managing teams for the gamified interventions are studied, the choice of the participants is substantiated per gamified intervention.

For the system analysis one-day observations are done at both the two self-managing teams. In addition, the performance is analyzed and a survey is conducted as explained in Appendix A1 and A3. The performance of the two self-managing teams and Dagelijkse Bankzaken are studied for 5 weeks and measured in terms of efficiency, quality of service and inventory control. Next to quantitative results, semi-structured interviews are used to check for the quantitative findings and to achieve more detailed information, see Appendix A2. Ten self-managing team members of which 6 employees of the experimental group and 4 employees of the control group are interviewed. In addition, an interview is conducted with the team manager and senior employee of the sub-division. An overview of the used measurements methods for data gathering is shown in table 5.

Table 5 Research Set-up for System Analysis

System Analysis quan + QUAL	
Quantitative Measurements	*Qualitative Measurements*
Performance Measurement	Observations
Survey	Semi-structured Interviews

4.2 Research Set-up of First Gamified Intervention

For the gamified intervention one self-managing and one control team at a sub-division of Dagelijkse Bankzaken participates. The sub-division is chosen out of two available sub-division assigned by higher management. The choice for the particular sub-division is made as the other sub-division just got a new team manager at the start of the case study. The research set-up of this gamified intervention is as follows.

Experimental Design
For the first gamified intervention a quasi-experimental design is used. The chosen self-managing team worked with the gamified intervention in week 50 and 51, while another self-managing team is tracked as the control team. Both groups got the same attention of the researcher, the same information, observations, survey and interviews. In contrast to a full experimental design, these existing self-managing teams are not randomized but assigned as either experimental or control groups. For the experimental group, one self-managing team is chosen out of the four available self-managing teams. This choice is based on the performance, availability and willingness of the self-managing teams. For the choice of the control group, attention is paid to the self-managing teams' characteristics and performance. According to the best possible match of similarity in team characteristics and performance, the control group is determined.

Participants

The two participating teams are team and team [redacted] of the sub-division [redacted] in the division Dagelijkse Bankzaken of ING Operational Services as highlighted in the organizational structure in Appendix CA1. The group composition and characteristics of both participating teams are shown in table 6.

Table 6 Participants of First Gamified Intervention

Group Composition	Experimental Group	Control Group
Super7	[redacted]	[redacted]
Number of Team Members	8	6
Gender	5 Male, 3 Female	1 Male, 5 Female
Nationality	All Dutch	All Dutch
Contract	2 Fixed, 6 Flexible	2 Fixed, 4 Flexible
Average Age	35	37
Total Working Hours per Week	296	173
Total Desired Working Hours per Week	286	169
Duration Employed at S7 Team	Between 1 week & 1,7 year	Between 6 weeks & 1,5 year
Duration Employed at ING	Between 3 weeks & 34 years	Between 6 weeks & 36 years
Number of Different Workflows	14	11
Productivity in Available Time Target	[redacted]	[redacted]
Average PIAT last 4 weeks	[redacted]	[redacted]

Due to prolonged illnesses only 6 out of 8 team members participated in the control group during the first gamified intervention. Moreover, in both teams new and experienced employees are employed. Two aspects are remarkable, as highlighted by the orange dots. First it is interesting that both self-managing teams prefer to work fewer hours than their current working hours. Second, it is important to note that both groups did not meet their efficiency target for the last four weeks, as represented by the PIAT score.

Procedure

To gain more insights in the self-managing teams, first a system analysis of the self-managing teams is performed. Accordingly, the need and relevance for a gamified intervention is determined. Next, a first gamification design is developed and validated by a game expert. The experimental group worked with the gamification design during a gamified intervention in week 50 and 51 of 2014. Meanwhile the control group got information about their daily performance and the same amount of attention from the researcher. Attention is paid to ethical issues and the influence of the researchers' presence on the behavior of self-managing team members. Before, during and after the gamified intervention the performance of both teams are measured. After the quantitative data gathering, a focus group is held with the experimental group in which all eight employees self-managing team evaluated the first gamified intervention and generated design changes for the gamification design.

Used Methods for Data Gathering

In order to analyze the performance, the performance of the experimental and control group are studied for week 45 till week 1 of 2015. The 5 weeks preceding the gamified intervention are used for both the problem analysis and the baseline measurement of the first gamified intervention in week 50 and 51. The performances are measured in terms of efficiency, quality of service and inventory control as explained in Appendix A3. To analyze the performance after the gamified intervention, week 52 and week 1 are studied. To benchmark the performances of both self-managing teams, also the performances of the division Dagelijkse Bankzaken is measured. The quantitative results of the performance measurements are complemented with qualitative insights from a focus group with eight self-managing team members of the experimental group. Table 7 provides an overview.

Table 7 Research Set-up for First Gamified Intervention

First Gamified Intervention	
quan + QUAL	
Quantitative Measurements	*Qualitative Measurements*
Performance Measurement	Focus Group

Data Analysis
Due to the number of 8 participants in the experimental group and 6 in the control group, no parametric tests could be conducted for statistical analysis of the results. For a sample t-test, an independent sample t-tests and a paired sample t-test a normal division of the experimental group is required. Non-parametric tests can still be executed, although these tests are less powerful to reject the initial hypotheses due to the ordinal measurement level (De Vocht, 2009). Therefore the focus is on qualitative data analysis, while being informed by the quantitative results.

Expected Results
As a result of the first gamified intervention, mainly some learning is expected regarding the gamification design and the contribution of a gamified intervention to the self-managing team performances. This will mainly constitute of qualitative findings, while being supported by the quantitative performance scores and survey results. Due to the small number of participants and the limited time period for the gamified intervention, the results should be interpreted with care. The first gamified intervention will conclude with some preliminary results regarding the contribution of gamification to the self-managing team performances and some promising ideas for design changes.

4.3 Research Set-up of Second Gamified Intervention

With the insights of the first gamified intervention, a second gamified intervention is conducted. The second gamified intervention took place in February 2015. After the first gamified intervention the choice is made to research the self-managing teams of the same sub-division. This is decided to be able to research more in-depth than to conduct a broader analysis with different self-managing teams of other sub-divisions. The experimental set-up of the second gamified intervention is as follows.

Experimental Design
With the insights of the first gamified intervention, the experimental design of the second gamification intervention is defined. A pre-experimental design is used for two participating experimental groups. No control group is used, as the data of 46 self-managing teams of Dagelijkse Bankzaken provides sufficient insights to benchmark the performance of the experimental groups. By researching another self-managing team, attention can be paid to the differences in team composition and task design. For the pre-experimental design, measurements are conducted before, during and after the gamified intervention.

Participants
In the second gamified intervention two self-managing team participate as experimental groups of which an overview in presented in table 8. The first experimental group is the same self-managing team as the experimental group of the first gamified intervention. The self-managing team works together in this group composition for about three months. Between the first and second gamified intervention, this team did not change in group composition, except for their employment duration due to the time period between the first and second gamified intervention. A little change is noted in the total number of working hours per week and the desired number of working hours. Furthermore, a fifteenth workflow is defined. It is important to be aware of the participation of this experimental group in the first gamified intervention, as some learning might have taken place that might influence their outcomes of the second gamified intervention.

The second experimental group is a new self-managing team composed one week before the second gamified intervention. Two employees and four workflows of one self-managing team are added to the self-managing team that functioned as the control group in the first gamified intervention. Both self-managing teams were part

of the same sub-division. Although a part of this experimental group did function as the control group of the first gamified intervention, they were complete unexperienced with the gamification design.

Two important remarks are to be made, as indicated by the orange dots in table 8. First, it is interesting to note that for the first experimental group the desired number of working hours is less than their current number of working hours while for the second experimental group this is vice versa. A second important remark is that at the start of 2015 targets and norms are revised. The efficiency targets defined by PIAT for both teams declined compared to the targets in the first gamified intervention. Due to changes in workflows and production norms, this does not necessarily mean that they have to be less efficient. The scores per experimental group also show that both self-managing teams performed below their efficiency target for the last five weeks.

Table 8 Participants of Second Gamified Intervention

Group Composition	**Experimental Group 1**	**Experimental Group 2**
Super7	[redacted]	[redacted]
Number of Team Members	8	8
Gender	5 Male, 3 Female	1 Male, 7 Female
Nationality	All Dutch	All Dutch
Contract	2 Fixed, 6 Flexible	2 Fixed, 6 Flexible
Average Age	35	36
Total Working Hours per Week	288	271
Total Desired Working Hours per Week	282	279
Duration Employed at S7 Team	Between 8 weeks & 1,8 years	Between 2 months & 1,5 years
Duration Employed at ING	Between 4 weeks & 34 years	Between 3 months & 36 years
Number of Different Workflows	15	15
Productivity in Available Time (PIAT) Target	[redacted]	[redacted] % *
Average PIAT last 4 weeks	[redacted]	[redacted]

* [redacted] merged one week before the second gamified intervention.
Before the intervention, [redacted] had a target of [redacted] %, Adressen had a target of [redacted] %

Procedure

With the knowledge gained from the first gamified intervention, a second gamification design is developed and validated by the COO, director of Operational Services and the directors of the divisions Dagelijkse Bankzaken and Specials of ING Domestic Bank. In the weeks 7 and 8 the research was conducted, whereas in week 9 and 10 the self-managing team and the team manager continued to use the gamified intervention in their daily work. Therefore, the performances in these four weeks are studied, next to five reference weeks in advance. As the week 10 was at the end of this research, it was not possible to study the performance during the weeks after the second gamified intervention. However intermediate measurements are held after the two weekly gamified intervention. Therewith several quantitative and qualitative measurements are conducted before, during and after two weeks of the gamified intervention while attention is paid to ethical issues and the influence of the researchers' presence. Next to the evaluation and ideation for design changes after the second gamified intervention, both focus groups also addressed the recommendations for embedding gamification at ING. Lastly, the final results of the second gamified intervention are discussed with all team managers of Dagelijkse Bankzaken and subsequently with the director of Operational Services, Dagelijkse Bankzaken and Specials in order to evaluate the contribution of gamification and to arrive at recommendations and next steps.

Used Methods for Data Gathering
In order to measure the contribution of gamification on the performance of self-managing teams, the performances of self-managing teams are measured in terms of efficiency, quality and inventory control. The metrics of each indicator are to be found in Appendix A3. Next to the corporate performance indicators, their job satisfaction before and after the experiment is determined. This is examined by a standardized questionnaire, as to be found in Appendix A4.

In order to gain more insight in the contribution to the self-managing team performances, the results of the motivational needs scores are studied. Also for determining the motivational needs, a standardized questionnaire is used, which is to be found in Appendix A5. Lastly, an evaluation survey is conducted, see Appendix A8. The quantitative insights are checked and complemented with the qualitative insights from focus groups. By the focus groups, the gamified intervention is evaluated on three levels throughout the organization namely the self-managing teams, team managers of Dagelijkse Bankzaken and higher management of Operational Services. An overview of the measurement methods are shown in table 9.

Table 9 Research Set-up for Second Gamified Intervention

Second Gamified Intervention	
QUAN + qual	
Quantitative Measurements	*Qualitative Measurements*
Performance Measurement	Job Satisfaction Measurement
Motivational Needs Measurement	Focus Group
Evaluation Survey	(self-managing teams, team managers DBZ, management OS)

Data Analysis
Due to the number of 16 participants in the experiment, no parametric tests can be conducted for statistical analysis of the results. The performance measurement results are studied to gain insights in the contribution of gamification to the performances. Additional measurements are done to determine the job satisfaction prior and after the gamified intervention. To achieve a better understanding of the contribution of gamification, the motivational needs satisfaction is analyzed. For the perceived motivational need satisfaction, also the contribution per motivational affordance is valued by the self-managing teams. Therewith also a ranking of the contributing motivational affordances can be made. Lastly, the quantitative findings are checked by the rich qualitative available information, as focus groups are held with both self-managing teams, the team managers of Dagelijkse Bankzaken and higher management.

Expected Results
By the extensive analysis, the quantitative and qualitative results are triangulated. Therewith it is expected to achieve a good understanding of the contribution of gamification to the performances of self-managing teams. The expected results from the second gamified intervention are detailed performance measurement results accompanied by job satisfaction types. Furthermore, a scoring of the perceived levels of autonomy, competence and relatedness are expected by which the motivational needs satisfaction is determined and the contribution per motivational affordance is ranked. Next to the quantitative results, qualitative results on the use, usability and potential use of a gamified intervention in order to enhance their performances are expected. Lastly, the triangulated results of the gamified intervention are a basis for theory development and recommendations for the use of gamification for self-managing teams.

4.4 Conclusions upon the Case Study Design

The case study makes use of several quantitative and qualitative research methods. The results are triangulated in other to check the main findings and to gain a more rich understanding of the problem analysis and the contribution of the two gamification designs. For the system analysis the focus in on the qualitative data gathering, being informed by the quantitative data. For the first gamified intervention the qualitative data gathering is also dominant, for which the quantitative findings on the performance are used as the basis for evaluation by a focus group. For the second gamified intervention, the quantitative data gathering is dominant

which is enriched by qualitative data. By means of an intervention with the second gamification design the quantitative methods are used to analyze the contribution of gamification to the self-managing team performances, for which more insights are gathered by the motivational needs satisfaction. Next to the quantitative contribution, qualitative insights are used to substantiate the contribution in a qualitative manner. The research set-ups for the self-managing team analysis and both gamified interventions are summarized in figure 13.

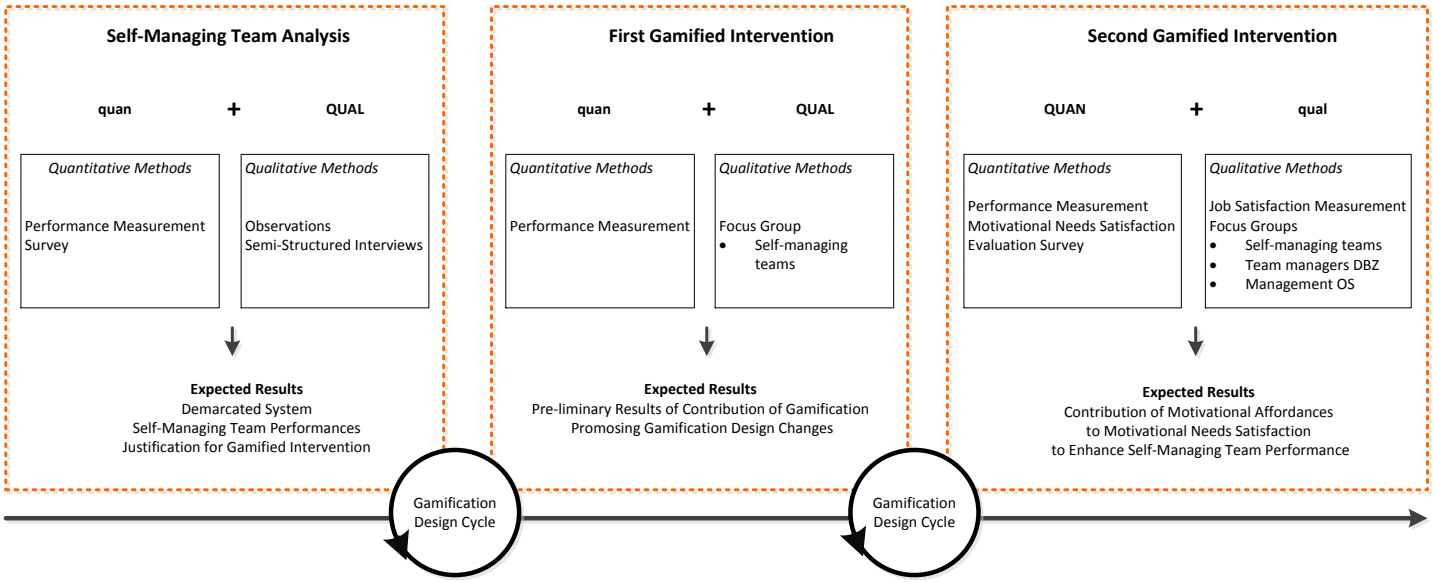


Figure 13 Case Study Design

5. Self-Managing Team Analysis

To research the contribution of gamification, self-managing teams at ING Operational Services are studied. In order to research a gamified intervention for self-managing teams properly, more insight should be achieved in the research objects and research context. Therefore first, the self-managing teams of the department of Operational Services at ING are introduced. Secondly, the relevant stakeholders and their interest in the performances of self-managing teams are identified. Thirdly the maturity levels are described followed by an overview of the team activities. Fifthly, the team composition is addressed. Sixthly the performances of self-managing teams are analyzed. Accordingly this chapter concludes with a systems diagram which demarcates the system of the self-managing teams of interest for this research.

5.1 Introducing Self-Managing Teams at ING Operational Services

ING Operational Services is located in Leeuwarden in the Netherlands and is the centralized operations department that handles most of the day-to-day customer requests. Operational Services is one of the thirteen departments, within the domain of the Chief Operating Officer (COO), whereas COO is the domain of the products, operational services and business change, where the focus is on fewer processes, less repetition, lower costs and higher customer satisfaction by simplifying the operational processes and product presentation. Operational Services (OS) is responsible for the staging and processing of customer data and products for the daily banking of ING private and business customers.

Within Operational Services, ING developed Super7 Operations to implement lean operations within an organization in the financial services sector (van Dijk, 2013). Super7 Operations is based on the principles of lean and operational management with autonomy and responsibility to the individual working teams, so-called Super7 teams. These Super7 teams are self-managing teams, who make the organization flexible to adapt fluctuations in daily demand and realizing, in most cases, throughput times of one day while maintaining the quality of their service. The self-managing teams were introduced as a new approach for ING to build further on the adopted operational management for improving the performance of the organization. The three main experienced benefits of the implementation of self-managing teams are a customer focused and employee-empowered business culture, a reduced backlog and a supportive management style with more autonomy for the teams.

Each sub-division has a defined number of self-managing teams. The self-managing teams at ING are in general teams of five to nine persons with different skills to be able to handle all tasks required within the team. A small team size should allow for visibility and trust in order to support effective decision making. Team managers of sub-divisions have a coaching role and steer their self-managing teams on their output, while being approachable for help at any time. This type of operational management gives the teams the authority and responsibility of self-managing teams, as they can decide for themselves who does what when. The main characteristics of these self-managing teams at ING Operational Services are summarized in table 10.

Table 10 Characteristics of Self-Managing Teams at ING

Self-managing teams
Customer focused
Flexibility in skills and capacity
Output and supportive management
Fixed daily schedule and management of incidents
Divide their own work and decide *how* to meet the daily targets
Continuous improvement of planning and forecast
Progress is visual

Self-managing teams focus on the customer while handling their workflows. Therewith they pay attention to the quality of service and the inventory control. Each team exists of members with fixed and flexible contracts,

so they can adapt their daily working hours to the total daily inflow of customer requests. The flexible contracts are min-max contracts of temporary employees, by which the maximum capacity of a flex force is 40 hours and the minimum capacity is 20 hours per week. Next to being flexible with the working hours, they are also flexible in their activities as they can schedule the meetings or training hours given within the team themselves. The flexible capacity does require all-round skilled employees, as they should be able to handle all workflows during the day. Therefore, self-managing teams are also responsible to manage the level of skillfulness within their team.

The manager steers the self-managing teams on output and encourages the team to come up with their own solutions. Therefore, the team themselves determine how their working day looks like and how they will meet the daily targets. Ideally, the self-managing team has fixed daily team meetings, aimed at a short constructive dialogue between the team and the team manager on their daily target and unforeseen events to be resolved to meet their target. The teams are encouraged to continuously improve, and to visualize the daily targets, ongoing or planned experiments for improvement and their performance.

5.2 Relevant Stakeholders and Their Interest in Self-Managing Teams

Within ING Domestic Bank Nederland stakeholders on different levels in the organization have an interest in performances of self-managing teams, as they handle the Bank's customer operational processes. The most important stakeholders involved in the performance of the self-managing teams are the customers, the self-managing team members, the self-managing team managers, higher management and operational excellence consultants, as concluded from the stakeholder analysis to be found in Appendix CA2. To get more insights in their interests, the objectives of higher management, team leaders and the self-managing teams are analyzed in Appendix CA3. The interest per stakeholder is based on the available documentation at ING accomplished by the insights from the interviews as to be found in Appendix CA6.

Regarding the interest in the performances of self-managing teams, the focus of higher management is on their service to the customer. To provide an excellent service, at least one employee should be available from 8 a.m. and should handle all inflow until 7 p.m. While handling their workflows, self-managing team members should be focused on delivering high quality service. Highly satisfied employees are likely to make the extra step needed to provide the optimal customer experience. While delivering high quality service, higher management is also concerned with the profitability of the department. As self-managing teams have the responsibility to plan their working hours appropriately during the week and adapt them on the basis of the daily inflow of customer requests, the variable costs of the organization also concern the performances of self-managing teams.

The goals of top management should come into practice via middle management. Managers set the boundaries for the self-managing teams. To have their sub-division delivering high quality service, the self-managing teams should handle the customer requests according to the customer focused and TITO principles while meeting the compliance regulations. To handle all customer requests within the self-managing team, the team should be all-round trained. While delivering high quality service, a second objective is to manage the operations in a profitable way. Managers are confronted with efficiency target, however due to decentralization, the role of the self-managing team manager should be a more supportive than active steering role in order to achieve this target. Managers have to deal with the tension between command and control and supporting self-management in order to achieve their targets within the time set.

Operational excellence consultants are active in the Operational Services department to determine how the department can excel in its performance by performing analysis, identifying root causes and possible solutions. The aim is to achieve such a high level of customer satisfaction that the customers become promotors of ING and recommend the company to their own environment. Next to the customer satisfaction, they focus on the potential for continuous improvement. Their current interest is the efficiency of self-managing teams, as this is

indicated as weakness in their performance and provides potential for improvement. For the organization to remain competitive, it is valuable to address the efficiency challenges for self-managing teams.

Self-managing team members indicate that their main focus is on the customer, while handling their workflows. They are really motivated to deliver high quality service and to process all customer requests the same day. Meanwhile, self-managing teams are confronted with the difficult challenge to determine when and who should downscale or upscale. It is important to be aware that each team also exists of seven individuals, who also each have their own objectives reflected in the daily operations. The desired number of working hours might be conflicting with the efficiency targets set on a higher management level. As downscaling is directly reflected in the salary of the employees with a flexible contract or in the vacation hours of employees with a fixed contract, this turns out to be a bigger challenge to manage than upscaling.

Table 11 Main Objectives regarding Self-Managing Team Performance

Desired high levels
Quality of Service
Inventory Control (Today In, Today Out)
Efficiency: Productivity, Working Hours Present
Employee Satisfaction
Skillfulness Level
Insight in Performance
Compliance (Constraint)

Table 11 summarizes the relevant objectives regarding the performances of self-managing teams. The main focus is on delivering high quality service. In order to do so, self-managing teams should handle the workflows according to customer focused and TITO principles while being compliant. To deliver a reliable service, self-managing teams should be aware of the availability of employees by managing the working hours and their skillfulness. For the Operational Service department to stay profitable, self-managing teams should also be aware of their efficiency performances. Therefore, a good balance is needed between the productivity and the working hours present. In order to have satisfied employees, it is important that they have clear insights in the goals, capabilities and performances. A good performance at work is one way to increase the employee satisfaction, next to a good ambiance at work and meeting personal goals to a certain extent.

5.3 Task Design of Self-Managing Teams

The studied self-managing teams at ING operational services handle the customer operational processes. As there are many customer operational processes, each self-managing team has their demarcated customer processes which they ideally handle from the inflow of customer requests to the processed and completed customer requests. The tasks of self-managing teams are described by means of a functional modelling method IDEF0, on which a more elaborated explanation and decomposed models are to be found in Appendix CA4. Figure 14 shows a generalization of these tasks for self-managing teams on a daily basis.

Inflow of Customer Requests

Each self-managing team is bounded by business roles, by which they are given authorization to process certain workflows. Therewith each team processes certain types of customer requests. For instance, a team handles bank cards requests and for compliance reasons they are not authorized to handle another type of customer requests like address changes. No matter what type the specific request is, the inflow can be categorized in emailed requests that arrive in the mailbox, physical requests that come through the ING post office and requests that are on a printout list of requests that are composed by a system over night. Special types of physical requests are the undeliverable mail and undeliverable bank or credit cards. The customer requests either come from the customer himself, from an employee at an ING office who is helping the customer at the office desk, from a customer service line within ING services or as a referral from another division within ING.

Support the Task Execution

To process the inflow of customer requests, persons and objects are present to support the task execution which are called mechanisms in the functional modelling. The self-managing teams members are key in handling the workflows. However, if they need help the team manager is available to support them. Furthermore, they make use of tools and software to actually process the customer requests.

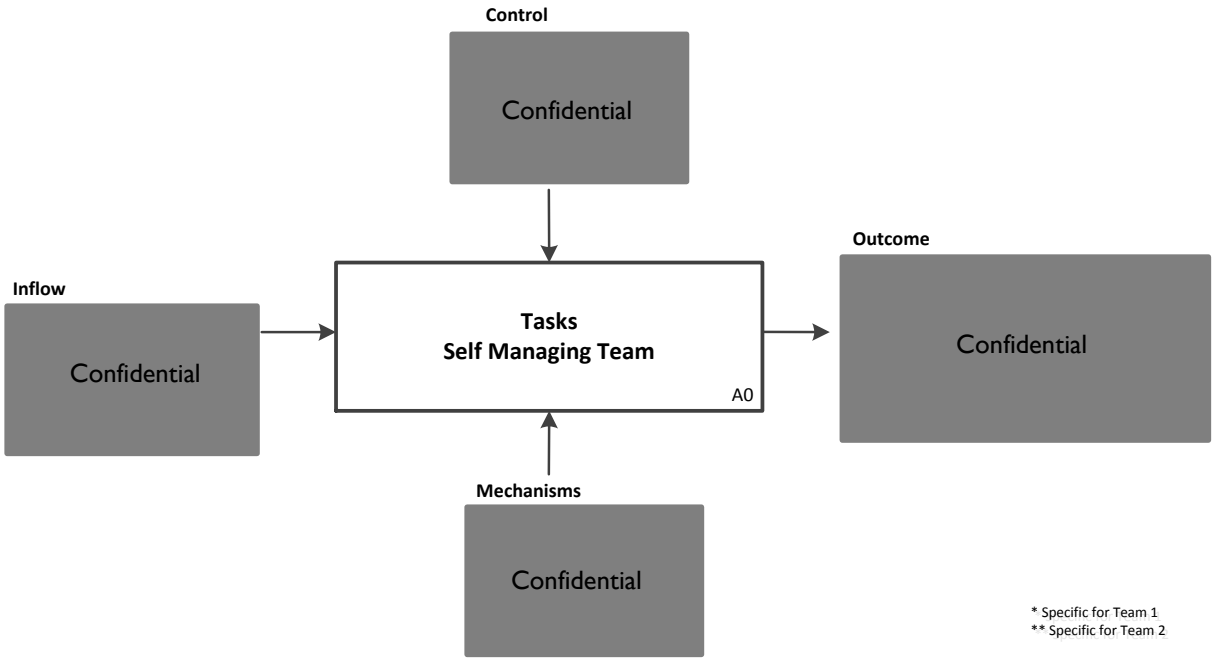


Figure 14 High Level Task Design of Self-Managing Teams at ING Operational Services

Furthermore, self-managing teams have different controls which they can use to manage their tasks properly. These controls are the forecasts, working schedules, work instructions, production norms, quality and TITO checks. The forecast is used to approach the inflow per workflow and accordingly determine the total required working hours to process this inflow at the same day. The challenge for self-managing teams is to make this forecast as accurate as possible, given unexpected events as different opening hours of offices, holidays or mailings of an external party. According to the estimate of required working hours, a working schedule can be made while paying attention to the extra time needed for training and quality control.

Outcome of the tasks of Self-Managing Teams

The self-managing team takes their own decisions regarding the use of mechanisms and controls. Therewith they pay attention to the feasibilty of processing the total inflow of customer requests on the same day according to the quality standards. The outcome are the processed customer requests. While processing all the inflow, performance lists are composed about their quality and inventory control.

Demarcating the Tasks of Interest

The task analysis shows that the generalized tasks of managing inflow, mechanisms and control are relevant in order to achieve the target outcomes. The specific tasks to conduct these workflows, as decomposed in the Appendix CA4 is to a much lesser extent of interest. Instead of focusing on specific solutions for each workflow it is more interesting to focus on how the self-managing teams in general can be supported to continuously improve their performances. Therewith technical changes to the system and institutional changes like for instance the minimum or maximum number of working hours for flex workers in order to improve performances are out of scope. The technical and institutional changes could probably not be realized within the time horizon of this research. Concluding that the focus is on the self-management tasks of self-managing teams, which influences the way they manage their tasks given the inflow of customer requests in order to achieve the desired outcomes.

5.4 Team Composition & Their Perceptions

As the team composition is a known influence of the teams' performances (Sales, et al., 2008), the team composition of the two participating self-managing teams are described. The teams are composed by their team managers and the director of the division 'Dagelijkse Bankzaken'. Depending on the willingness of a new employee and the availability in a team, an employee is added to a self-managing team. The demographics of the two self-managing teams are described in chapter 4. This paragraph will present more insights regarding the maturity level, color print thinking, skillfulness and the perceptions of the two participating self-managing teams.

Maturity level

In chapter 2.3 the maturity levels of self-managing teams are explained. The maturity levels are determined by the observations and checked by the team manager. Both self-managing teams are between the first stage of forming and storming at therewith not very mature. First regarding job tenure, both self-managing teams have reached a desired level of flexibility as all self-managing team members are employed at different workflows. Second, limited regulatory tasks are conducted and the executive tasks could be expended with more regulatory tasks. Third, the teams do rotate their tasks while the manager is still mainly responsible for handling conflicts in the teams. Fourth, both teams perform the least at their degree of goal and performance orientation. The goals are mainly set by the team manager and the team does not advise on team goals or production norms and they do not analyze their own performance or propose ways to improve it. Therewith, the maturity levels of both self-managing teams are quite similar for which both teams are also chosen.

Color Print Thinking

The color print thinking profiles describe the different people within the team. Table 12 shows the results compared to the average of four thousand randomized Dutch people (Caluwé, 2012). The print thinking test is also conducted with a group of thirty-three operational excellence consultants to compare the scores of self-managing teams with other teams within ING. It is interesting that for both self-managing teams and the operational excellence consultants the scores are not extremely different than the Dutch average. An interesting remark is that both self-managing teams have a relatively low score on the white print thinking, as for people with high white print scores are likely to be moved by self-steering. This might even stress the potential of gamification, as a gamified intervention might create a competition that is likely to move people with a predominantly yellow print thinking profile, a challenge that might energize blue print thinkers, a storyline that might engage red print thinkers and learning and exploration that might address the motivation of green print thinkers.

Table 12 Scores of Color Print Thinking

	Number of Respondents	Yellow Print Score	Blue Print Score	Red Print Score	Green Print Score	White Print Score
Dutch Average	4000	***13***	***19***	***18***	***20***	***26***
Experimental Group	8	+2	+3	+3	-1	-7
Control Group	5	+1	+4	+6	-2	-8
OEC	33	+1	+5	-1	-2	-4

Skillfulness

Next to the color print thinking, the level of skillfulness of the self-managing team might influence their performance. As self-managing team members are responsible for training other team members, the amount of required training influences their netto working hours. However more skilled employees enable a team to be more flexible in managing the presence of their workforce over the day and the division of tasks. All-round employees are able to handle all workflows and are able to train and coach other employees. The self-managing teams of the experimental group and control group indicated in the survey as shown in Appendix A1 their skillfulness. An overview of the learners and all-round employees is shown in table 13. As highlighted by the orange dots two aspects are remarkable.

Training does not have to be a high priority for both self-managing teams, as teams have multiple employees to handle each workflow except for workflow eleven of the first experimental group. The control group has less workflows than the experimental group and the team has fewer new and unexperienced employees. They have no learners in their team at all, although not all are full-skilled for all workflows. This is explained by the fact that not all employees value it necessary to become more skilled at these workflows. Therewith it is likely that the experimental group will spend more time on training than the control group.

Table 13 Overview of Learners and Full-Skilled Employees per Self-Managing Team

	Experimental Group *7 Respondents out of 8*		**Control Group** *5 Respondents* out of 6	
	Learners	Full-Skilled	Learners	Full-Skilled
Workflow 1	1	6	0	5
Workflow 2	1	6	0	4
Workflow 3	2	5	0	5
Workflow 4	4	3	0	5
Workflow 5	1	6	0	5
Workflow 6	0	7	0	5
Workflow 7	1	6	0	5
Workflow 8	2	5	0	4
Workflow 9	3	4	0	4
Workflow 10	3	4	0	5
Workflow 11	4	1	0	5
Workflow 12	2	5	0	-
Workflow 13	1	6	0	-
Workflow 14	2	5	0	-
Quality Control	5	2	0	4
Management Support	3	2	0	4
Projects	3	2	0	4

Perceptions of Self-Managing Teams

With knowledge of their skillfulness, it is interesting to see how they perceive their competence. Competence is considered as a motivational need, next to autonomy and relatedness. By means of the survey as shown in Appendix A1, both experimental and control group indicated their perceptions. The scores from the experimental group are based on seven respondents, the control group on five respondents. Figure 15 gives an overview of the perceived motivational need satisfaction, next to their indicated enjoyment and motivation for their work and how they would score their own performances on the management indicators of productivity, efficiency and effectiveness.

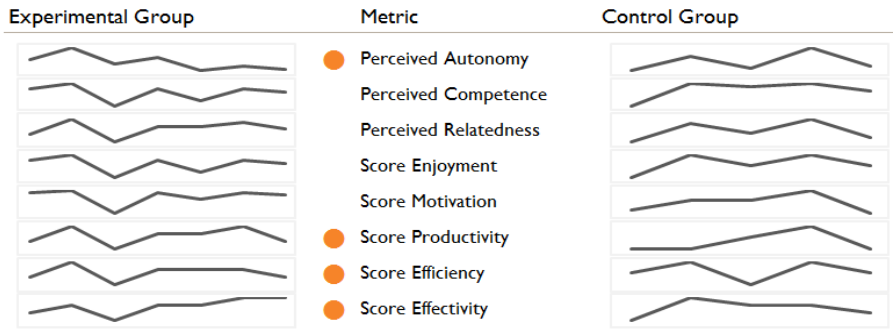


Figure 15 Perceived Motivational Need Satisfaction & Perceptions of Performance

As shown in figure 16, the perceived level of autonomy is relatively low. Which is interesting for self-managing teams as the organizational structure should support more autonomy. Self-managing team members explain in the interviews their lack of autonomy by not knowing how they can influence their performance, next to what their manager tells them. Accordingly it is interesting to see that the perceived productivity, efficiency and effectiveness of the self-managing teams differ much among the self-managing team members. These differences might be caused by different perceptions or by different level of insight in their performances. However, to enhance the perceived autonomy they should also be aware of their performance in order to determine which actions to take to enhance these performances.

The control group shows a high level of perceived competence, whereas for the experimental team three employees indicate a relatively low score which both is in line with the skills matrix. Combining the lines of autonomy, competence and relatedness the average score can be compared to the self-managing teams score on their motivation.

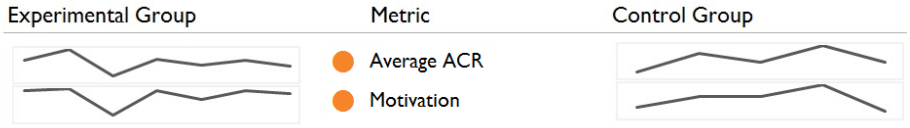


Figure 16 Perceived Autonomy, Competence & Relatedness compared to Perceived Motivation

Figure 16 shows that the scoring for the perceived autonomy, competence and related is representative for the perceived motivation of the teams. The gamified interventions will address these three motivational needs in order to increase the motivational needs satisfaction to contribute to the self-managing team performances.

5.5 Self-Managing Team Performance

The performance of Operational Services is analyzed by higher management and operational excellence consultants to determine how the department can excel in its performance. Looking at the performance on the performance indicators, the efficiency of the established self-managing teams is identified as a weakness in their performance, while their average performance on inventory control and quality is quite good. The skillfulness differs per team, however in paragraph 4.5 is shown that the skillfulness is not a problem at the two studied self-managing teams. The efficiency also became a point of attention for Dagelijkse Bankzaken as higher management of Operational Services and operational excellence consultants identified a potential of [redacted]% increase in efficiency on average per self-managing team. This potential is to be found in working smarter and by mitigating the non-value adding activities. It is important to stress that this potential is not be achieved by working harder or paying less attention to the customer focused service.

For the definition of the potential for improvement, it is important to be aware of the fact that at time of the baseline performance not all self-managing teams throughout the two divisions were completely equal in their performance level. Already high performing self-managing teams during the baseline measurement might have a disadvantage in meeting the potential for improvement compared to worse performing teams at that time. Moreover, it is important to note that the measurements for the potential efficiency improvement were conducted during the summer, whereas holidays and additional leave might have influenced the measurements. Lastly, the teams might have shown strategic behavior in order to influence the measurement in their advantage. However, according to the strategy of the department, the self-managing teams should focus on continuous improvement, no matter what their precise baseline performance is. Taking these arguments into consideration, it is advisable to study each self-managing team individually.

The efficiency performances are studied by means of three types of graphs, namely the graphs for efficiency, division of working hours and the hours spend on regulatory tasks. Next to these two participating self-managing teams, the performance of Dagelijkse Bankzaken are analyzed. Dagelijkse Bankzaken exists of 46 self-managing teams and the total data of these self-managing teams are used in the performance graphs.

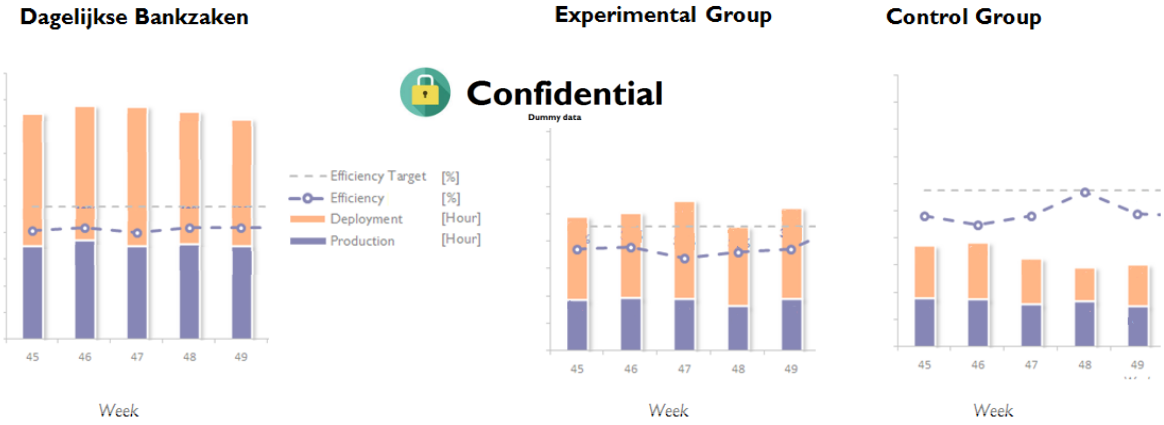


Figure 17 Efficiency Performance

The efficiency performance in figure 17 shows the efficiency targets and the efficiency performances for Dagelijkse Bankzaken and both experimental teams. The orange bars represent the working hours and the blue bars presents the production calculated in delivered production hours. The delivered production hours are calculated by multiplying the number of customer requests times the production norm and therewith only the normalized production contributes to the efficiency. The 46 self-managing teams of Dagelijkse Bankzaken together to do meet their efficiency target of [redacted]%. The graphs for the efficiency performance of both experimental groups show that their efficiency targets of respectively [redacted]% and [redacted]% are also not met.

The number of working hours differs per self-managing team as the first experimental group exists of 8 employees and the second experimental group of 6. Therefore, it is interesting to study the division of working hours into more detail, see figure 18. The division of work for Dagelijkse Bankzaken shows that the self-managing teams spend about [redacted]% of their hours on production that contributes to the efficiency, namely the normalized production. The other [redacted]% of their time, they spend on non-defined or non-normalized production and regulatory tasks.

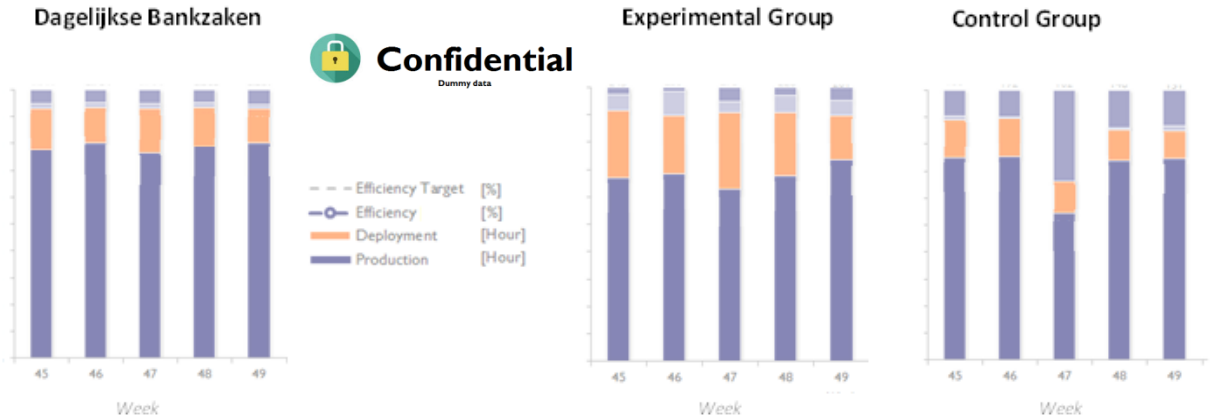


Figure 18 Division of Working Hours

The division of working hours of the first experimental group shows that they spend about [redacted] till [redacted] % of their time on other production and non-normalized production. Adding the time spend on regulatory tasks, they do not meet the [redacted]%-[redacted]% ratio of hours spend on normalized production. As for the other production the workflows are not defined, it is unknown for ING Operational Services where they exactly spend this percentage of time on.

The control group shows a quite continuous division of their working hours in which they spend about [redacted]% of their time on normalized production. In contrast to the first experimental group all their tasks are defined and next to the regulatory tasks, they spend all their time on defined production which is either normalized or non-normalized. The division of working hours also highlights that the type of customer request inflow varies throughout the year, as some events might cause a temporary increase for the inflow of a particular type of workflow. For instance, a particular mailing might have caused the increase of time spend on non-normalized production in week 47.

Next to production, self-managing teams have to manage their quality control, inventory management and the skillfulness of their team members by giving each other training. These tasks and the meetings and consultation to manage this are summarized in the time spend on regulatory tasks. The division of working hours spend on regulatory tasks is shown in figure 19.

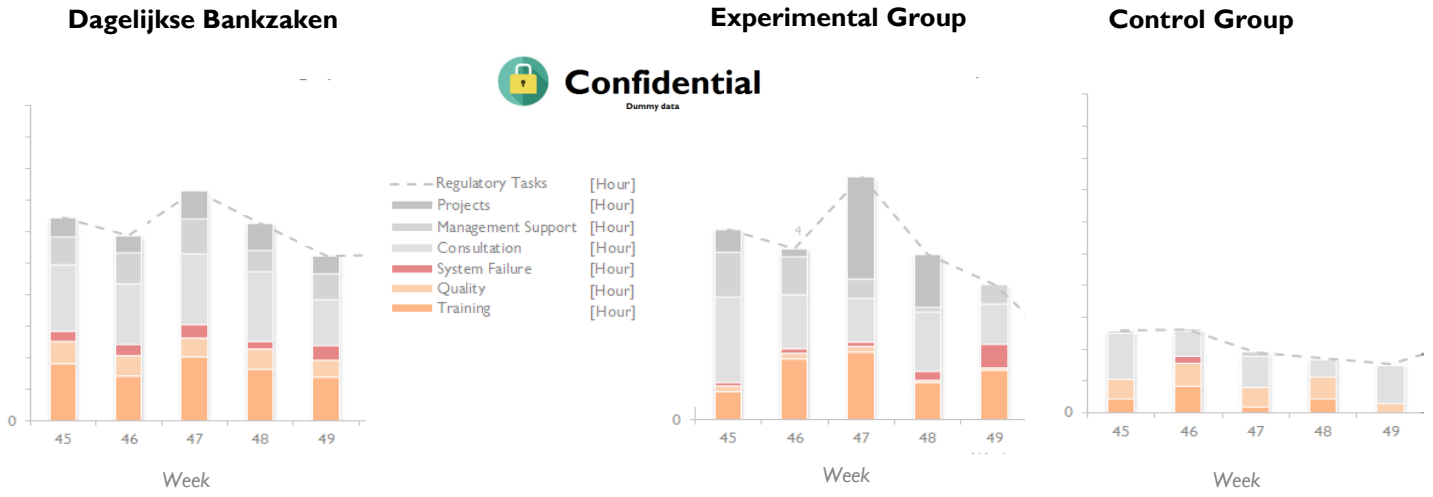


Figure 19 Hours Spend on Regulatory Tasks

Dagelijkse Bankzaken shows a more or less constant level of hours spend on quality control, consultation, management support and projects. The variation in regulatory tasks is mainly caused by the hours spend on training. Furthermore it is important to note that the 46 self-managing teams together also experience [redacted] hours per week of system failures which block their work activities to a certain extent.

The experimental group shows more variation in the hours spend on regulatory tasks and their total number of regulatory hours are roughly 40 hours per week more than the control group. This is explained by the presence of a senior employee in the experimental team until week 48. A senior employee has more meetings and participates in different kind of projects. In week 49 the total hours spend on regulatory tasks also declined.

5.6 Conclusions upon the Self-Managing Team Analysis

The gamified intervention is focused on the tasks of self-managing teams, in which several stakeholders have an interest to achieve the desired outcomes. Self-managing teams are dependent of the daily inflow of customer requests and have to manage their tasks in such a way that they arrive at the target outcomes for efficiency, quality and inventory control. Although the performances are also influenced by the technical systems and institutional agreements and compliance regulations, this research focuses on the motivational needs of self-

managing teams to arrive at the desired self-managing team outcomes in terms of efficiency, quality and inventory control performance and job satisfaction. Therefore two gamified interventions are studied with a gamification design that includes the four motivational affordances of compete, challenge, explore and empathize. An overview of the system of interest of self-managing team performance is shown in figure 20.

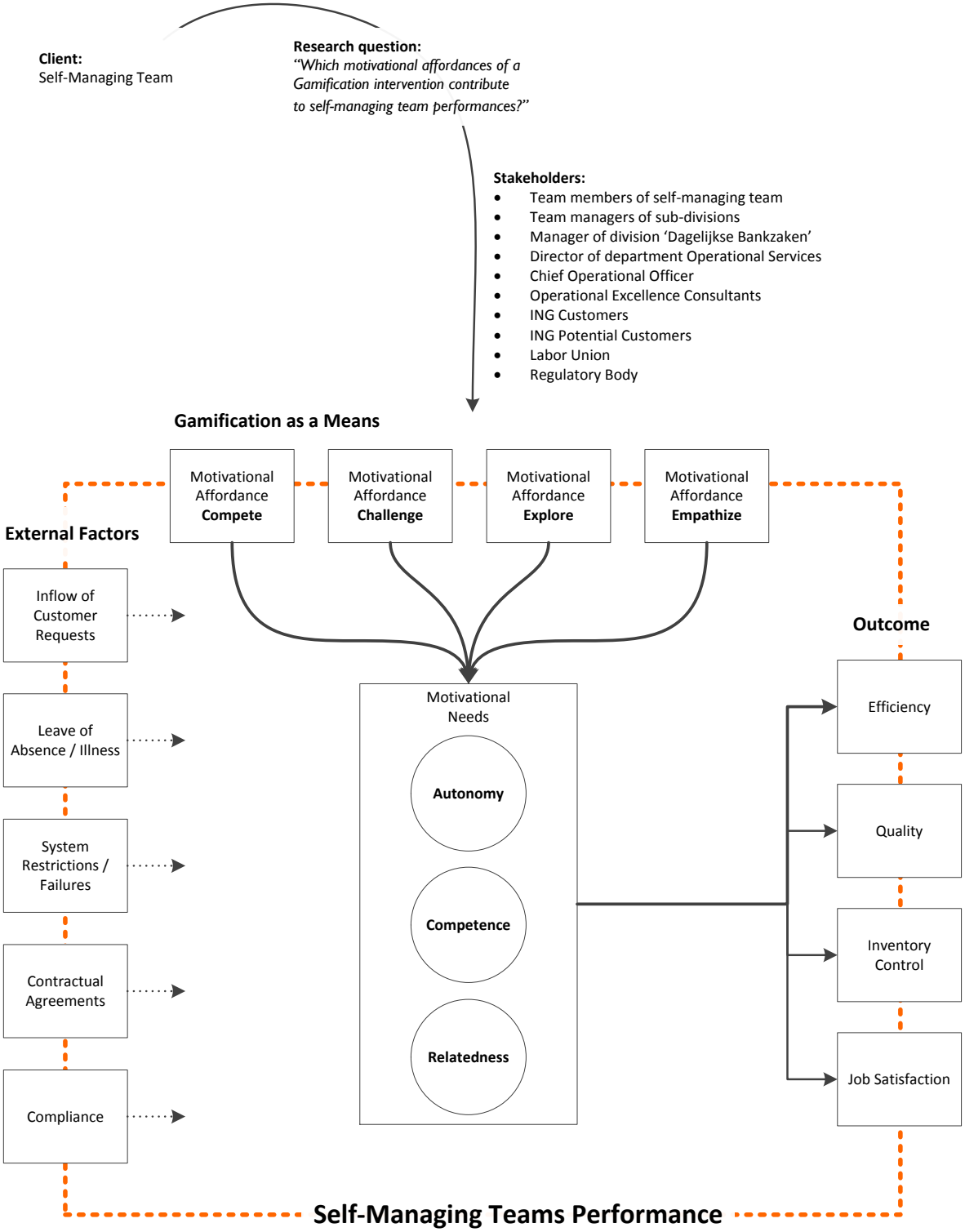


Figure 20 Overview of Gamification for Self-Managing Team Performance

6. First Gamification Design & the Gamified Intervention

The self-managing team analysis justifies the need and relevance of a gamified intervention for two self-managing teams of the sub-division [redacted] at ING Operational Services. The aim of a gamified intervention is to support self-managing teams in their self-management of tasks in order to arrive at an efficient way of processing customer requests while meeting the standard for quality of service and inventory control. To develop a gamification design for the gamified intervention, the innovation mode of the gamification design process by Deterding (2014c) is followed as no existing gamified system is in place. The knowledge gathered in the system analysis is used to substantiate the design choices.

This chapter elaborates on the five design steps taken in the gamification design process and the first prototype for the gamified intervention. Accordingly, a gamified intervention is conducted for which the research set-up is described in paragraph 4.2. As the aim of this first study is primarily to learn about the application and contribution of gamification to self-managing team effectiveness, this chapter will conclude with the results of the intervention, preliminary conclusions and suggestions for improvement.

6.1 Strategy

The system analysis of self-managing teams highlights that the self-managing teams at ING Operational Services are strongly focused on the principle TITO for which they provide service to the customer on the same day. However the affordability of this service is to a certain extent neglected, see also the interview with an operational excellence consultant in Appendix CA6. Therefore a gamified intervention could be useful in order to support self-managing teams in customer focused and efficient self-management of their tasks. To arrive at a delineated strategy for a gamified intervention, three key design choices are made. First the target outcome is defined. Accordingly the target users are defined, followed by their target activities that contribute to the target outcome. Table 14 presents an overview of the strategy.

6.1.1 Target Outcome

Self-managing teams at ING Operational Services are responsible for staging and processing customer data and products for the daily banking of ING private and business customers. To handle their tasks the focus is on the customer, more specifically on the quality and throughput times of their service. The performance analysis of self-managing teams at ING Operational Services shows that the self-managing teams handle practically all customer requests according to the quality standard and on the same day. Their level of skillfulness is sufficient to be flexible with their workforce in order to adapt to the fluctuating inflow of customer requests. However the efficiency of self-managing teams shows potential for improvement.

Therefore, the target outcome is the efficiency target as set for each individual self-managing team by operational excellence consultants of ING. The efficiency target differs per self-managing team and is set to [redacted]% for the experimental group and to [redacted]% for the control group. Secondary target outcomes are at least the same level of quality of service and throughput times according to the TITO principle for which they process customer requests the same day of their arrival. The metrics for measuring the target outcomes are explained in Appendix A3.

6.1.2 Target Users

The target outcomes are mainly influenced by the self-managing teams themselves and their manager. Team managers should take a coaching and supportive role to empower their self-managing teams to achieve success (Druskat & Wheeler, 2003). Therewith the team manager contributes to the target outcome via his or her influence on the self-managing teams. The self-managing teams themselves directly contribute to the target outcome and therefore the choice is made to focus on self-managing teams. Although a self-managing team exists of individual employees, the target users are the teams as the target outcome also concern team performances.

6.1.3 Target Activities

The self-managing teams influence their performance by the self-management and execution of their tasks. The task design differs per self-managing team, as each team has its demarcated type of customer requests. Although the execution of their tasks contributes to the target outcome, the purpose of self-managing teams is that they decide for themselves how they can optimally execute their tasks. Therefore, the focus for the gamified intervention is to support the teams in their self-management in order to achieve the target outcome. The self-managing teams have to find out themselves how they can work smarter and mitigate the so-called waste in their processes, which are the time consuming, unnecessary or non-value adding processes. The focus on working smarter is important to note because a focus on working harder would lead to an unfeasible production norm for the long term.

To work smarter, changes to the technical system could make the tasks easier to process and changes to the organizational agreements could expand their flexibility. For instance they currently print a request, set a signature and accordingly scan the request which could easily be optimized by a technical adjustment to use digital signatures by which they increase their efficiency. Another example is that currently a temporary workforce has to be paid for a minimum of three hours if he or she is attending to work, whereas the possibility to call a temporary worker for less than three hours could also contribute to their efficiency. Although these technical task and institutional changes might influence the performances with respect to the efficiency target, these changes could probably not be realized within the time horizon of this research. Therefore, these possibilities in terms of tasks conditions and organizational agreements are out of scope.

Table 14 Strategy of the Gamification Design

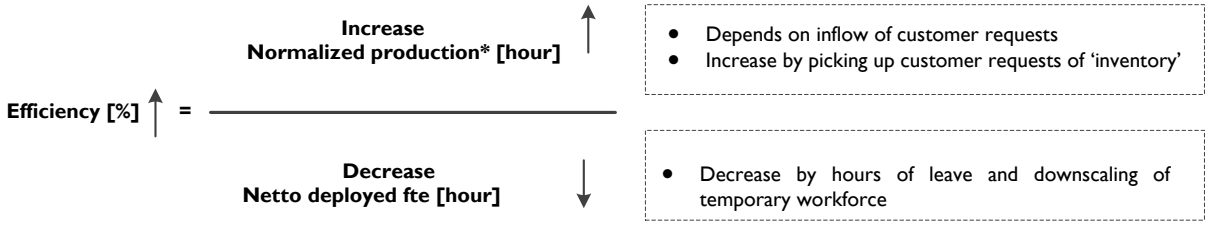
Design Choices	
Target Outcome	Efficiency target per self-managing team *(% for Experimental Group, % for Control Group)* Quality of service of % first time right Inventory control of % TITO Enhanced Job Satisfaction
Target Users	Self-managing team
Target Activities	Self-management tasks

6.2 Research

Self-managing teams are confronted with quite a challenging task in order to follow the strategy as defined in the first design step. Therefore, it is useful to break the self-management processes down and gain more insight in how they can contribute to the efficiency target while keeping an eye on the quality of service and inventory control. In this second design step the activities are defined that contribute to the intended outcome of the gamification design. Moreover, the user needs, motivations and hurdles are described that should be addressed to support the self-managing teams in their activities. Lastly, based on the activities, user needs, motivations and hurdles the fit for a gamified intervention will be justified.

6.2.1 Operationalizing the Target Activities

The first focus of the target activities is on the outcome of the self-management of the tasks by self-managing teams, whereas a second focus is on the self-management processes themselves as also shown in figure 10. The efficiency of self-managing teams is determined by the normalized production and the netto-deployed fte, whereby for the netto-deployed fte the hours of absenteeism and leave are subtracted from the total full time equivalent of 36 hours per week. The normalized production is the production of processed customer requests times the norm set for processing the customer requests per hour. In order to increase the efficiency of a self-managing team, either the normalized production in the total number of working hours should increase or the same normalized production should be conducted in less working hours as shown in figure 21.



** Normalized production [hour] = Production [unit] * Norm production per hour [hour/unit]*

Figure 21 Target Activities that Contribute to the Target Outcome of Efficiency

For the normalized production, the self-managing teams are dependent on the inflow of customer requests via different canals during the day. Although the inflow fluctuates, they do have forecast tools to estimate the daily-expected inflow per workflow. For each workflow, a norm is set for the production of a customer request per hour according to which they can forecast the number of hours needed to process the expected production. Next to the daily inflow, the self-managing teams might have some form of inventory of customer requests. For example, the experimental group has a list of address amendments of credit card owners for which they have to spread the processing over the month. Another example is the inventory for the control group, which is the undeliverable mail for which multiple self-managing teams can pick up a share of customer requests. The multiple self-managing teams together should process the undeliverable mail on the same day of arrival.

The normalized production is main type of production out of the four types that a self-managing team can deliver. For efficiency performance, only the normalized production is taken into account whereas this is the defined production of customer request for ING Operational Services. Other types of production are non-normalized production, other production and regulatory tasks. For the non-normalized production, ING knows what type of customer request they are processing but for which no norm is defined. The lack of a norm can be explained for several reasons, for instance if the processing times vary much for individual customer requests. Next, for the other production it is unknown what type of production the self-managing teams are conducting and therefore it is impossible to set a norm for the expected processing time. It is a choice of the organization to only include the normalized production to determine the efficiency and therewith a self-managing team should strive to the definition of their workflows and estimate their expected processing times. Next to the production, self-managing teams also spend time of their working hours on regulatory tasks as quality control, training and meetings.

Decreasing the netto deployed fte while maintaining the same level of normalized production is another way for self-managing teams to increase their efficiency. However, in order decrease the working hours they are bounded by the contractual agreements. A self-managing team exists of employees with a fixed contract and a flexible min-max contract. The temporary workforce has flexible contracts by which they can be deployed for 20 to 40 hours a week. By this construction the self-managing teams are guaranteed a minimal capacity while they can adapt their deployed hours to the daily inflow of customer requests. The deployed hours can be decreased by downscaling the working hours for temporary employees or by hours of leave of either fixed of temporary employees.

The second focus of the target activities is on the self-management processes. To improve the self-management processes, the job tenure, organizational independence, level of cooperation, degree of goals and performance oriented and level of team building can be enhanced as presented in figure 11. Important aspects for the team performance are the flexibility and adaptability, formal and informal rules, relationships, roles, coordination and communication within the self-managing teams (Rouse, et al., 1992). So it can be concluded that next to the main activities of increasing the normalized production or decreasing the netto fte, a target activity is to enhance the self-management processes themselves in order to arrive at improved performances.

6.2.2 User Needs, Motivations and Hurdles for the Target Activities

Although self-managing teams in general are aware that their performances are tracked and measured, they often do not have a full picture of how their performances are valued (Rimon, 2015). The results of the survey and interviews, see Appendix CA5 and CA6 show that the experimental and control group at ING Operational Services also have no clear understanding of their performance and how they can contribute to these performances. Literature shows that the ability to describe and explain the current system state and to predict the future system state is important for the team performances (Rouse, et al., 1992). Therefore, self-managing teams should understand the purpose of conducting the target activities and should be able to describe why they should achieve the target outcome. Accordingly, they should be able to explain how their self-management of tasks influences the target outcomes and subsequently they should be able to predict and steer their performances.

The main user need is an understanding of their efficiency performance and the activities that contribute to their performance in order to arrive at the efficiency target outcome. Next to an understanding, coordination and communication within the self-managing teams is needed to bring these activities in practice. More specifically, self-managing team can increase their efficiency if they are able to define the workflows of processing customer requests that are currently defined as other production and in addition, if they are also able to set an expected norm for the processing time. Secondly, they can increase their efficiency once they understand how they can decrease their netto fte and accordingly put the downscaling or use of hours of leave into practice.

A motivation to increase their efficiency might be the gained insights in their increased performance, whereas good performances may be perceived as satisfying by a higher perceived level of competence. Furthermore, the self-managing team members indicate that they are motivated by a challenge in their work and therefore a more efficient way of working might be seen as a challenge to meet see Appendix CA6. Especially if the efficient way of working should be achieved by not managing their hours spend on production but also the hours spend on internal training, meetings and quality control. Their insights in their own contribution might not only support the perceived competence but also the autonomy, as they understand how they can influence the outcome themselves. Furthermore, the self-managing team members indicate that they would like to see a better ambiance, team spirit and improved communication. Therewith, an increased perceived relatedness could be motivating.

Two main hurdles can be identified. The increase in efficiency can be valued as a hurdle, as self-managing team members indicate in interviews that downscaling is directly reflected in the salary of the temporary workers, see Appendix CA6. A second hurdle might be the questioning by self-managing teams why they should change their status quo and what is in it for them. As the target outcomes are mainly management goals, the hurdle to overcome is why the self-managing teams should want to achieve this target outcome.

6.2.3 Gamification Design Fit

According to the gamification design process, the fit for a gamification design is justified by a positive answer to the following four questions (Deterding, 2014c). The first question is if the actual user need connects to the target activity. As explained previously, the user need of an understanding of the efficiency performance is obviously connected to the activity of self-management to arrive at the target outcomes. Secondly, it is questioned if lacking motivation is a central issue. The motivation to downscale and to change the status quo is definitely a hurdle to overcome. Third, the question if the target activity involves a challenge with a learnable skill can be answered positively as the self-management of tasks to arrive the target outcome is something that is challenging and learnable. Lastly, the fit for a gamification design is justified as affording an experience of autonomy, competence and relatedness in the gamification design is an effective and efficient way to improve the performances.

6.3 Synthesis

In the first design step the target outcome for self-managing teams is defined and by the second design step a clear understanding of the contributing activities is gained by which the use of gamification is be justified. The third design step is the synthesis, which describes how a gamification design will meet the challenges of self-managing teams. To explain the use of gamification for the challenges at hand a model of the real world and game world is used (Visch, et al., 2013). In the real world, the self-managing teams have to gain insight in their performance, determine how they can contribute to their performance and therefore they have to enhance their self-management of tasks. To support the self-managing teams in their perceived autonomy, competence and relatedness to realize these challenges, gamification can be applied. Gamification creates a user experience in the game world in which the motivational needs of autonomy, competence and relatedness are to be satisfied. A game world is explicitly designed to fulfil those needs (Przybylski, et al., 2014) and by fulfilling the need for autonomy, competence and relatedness people can be stimulated to show behavior that influences performances positively (Ryan & Deci, 2000a).

6.3.1 Activity, challenge and motivation

According to the innovation mode of the gamification design process, activity-challenge-motivation triplets can be formulated which is the basis for the ideation. The motivations that energize and direct the target activities are the perceived level of autonomy, competence and relatedness. The challenge is to achieve the insights in efficiency performance and to understand how to influence the efficiency performance. The activities of self-managing teams are their self-management of tasks and specifically for efficiency to increase the normalized production or to decrease the deployed fte.

The self-management of tasks concerns the management of the working hours of employees, their training moments and other investments in their team in such a way that they handle all customer requests with the desired quality of service, according to the today in today out principle and while being compliant. While doing this, self-managing teams have the challenge do this in an efficient manner. With these activity-challenge-motivation triplets in mind, the design lens of skill atoms (Appendix A7) can be used to complement the skill atoms of the goal, rules and feedback of the gamification design.

6.3.2 Skill atoms

The overview of skill atoms in figure 22 visualizes the key aspects of the gamification design. The goal aligns with the target outcome of the gamified design, namely to achieve the efficiency target while maintaining the quality of service and the TITO inventory control. Users should become intrinsically and extrinsically motivated to perform the actions that contribute to the goal, but in order to do so, they need to have clear insights in these goals.

The main rules for the gamification design are that the efficiency target should be met, the customers should be satisfied and they should have processed all customer requests of that particular day. While focusing on being efficient, they have to take the constraints of the technical system and institutional environment into account. Therefore, they also have to handle their workflows as prescribed in their work instructions and they are bounded by their business roles due to compliance reasons. For the institutional environment, they cannot increase their efficiency by downscaling too much, because at least one self-managing team employee should be available between 8 a.m. and all incoming customer requests should be handled before 7 p.m.

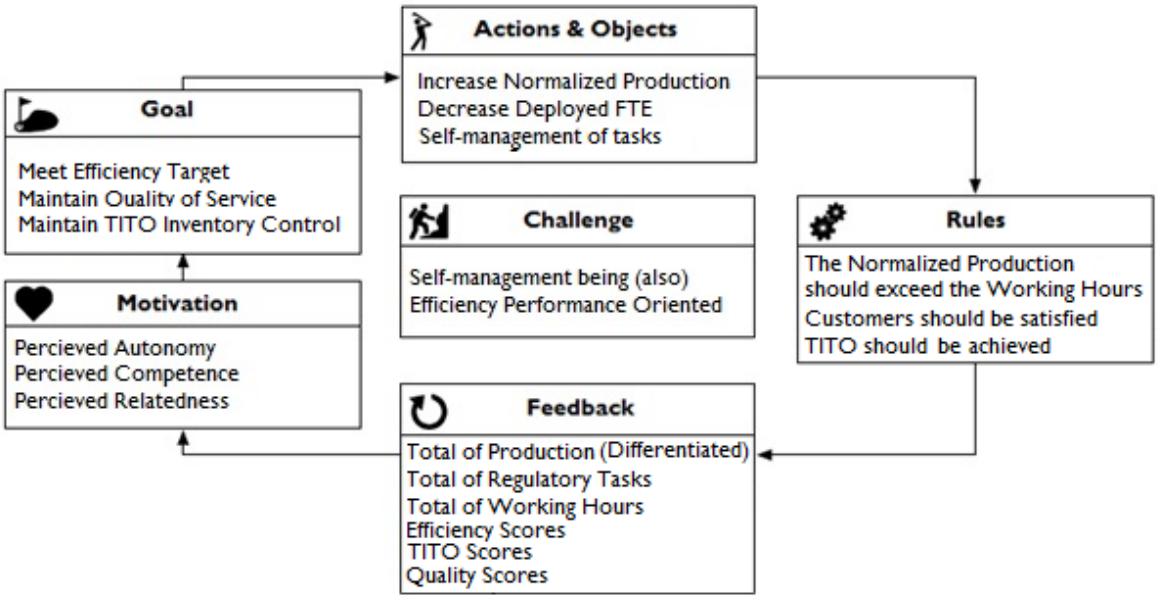


Figure 22 Skill Atoms of Self-Managing Teams for the First Gamification Design

Feedback enables the self-managing team to plan their actions properly in order to contribute to the goal. Therefore, the gamification design should provide the feedback that the self-managing teams need for their self-management of tasks. This concerns their production performance, their regulatory tasks, their total number of working hours and the efficiency scores that can be determined accordingly. In addition, they also need to think about their TITO inventory control and quality of services and therefore feedback on these performances should be provided.

6.4 Ideation

The skill atoms in the synthesis define the key aspects of the gamification design for the self-managing teams at ING Operational Services. During the ideation, these key aspects are translated to a gamification design. According to the innovation mode of the gamification design process, first innovation stems are used for brainstorming. Accordingly, the ideas are prioritized and subsequently brainstorm session is organized with one self-managing team, the experimental group who would work with the gamified intervention. The final ideas are presented by a storyboard that is the basis for the development of the first prototype.

6.4.1 Brainstorm Ideas using Innovation Stems

To arrive at ideas for a gamification design, other examples that share the same challenge are used for inspiration as this turns out to be more useful than just to come up with random ideas (VanPatter, 2012). For the brainstorm, five examples are used as inspiration. A first innovation stem is used as inspiration to create a clear understanding of the target outcomes and contributing activities for self-managing teams. A second example is used to think of how the design might stimulate the execution of the activities that contribute to the target outcomes. Third, an inspiring example is looked at for the creation of motivation. Fourth, inspiration is gained from an example of team performances in order to think of how the design might enhance the self-managing team performances. The last example is used as inspiration for achieving the desired mind-set for quality, throughput times and efficiency performance.

The first example is the user profiles of LinkedIn, to which many gamification blogs refer as a classic gamification example (Huotari & Hamari, 2011). LinkedIn makes use of progress bars of the main indicators. In addition, they clearly show what actions to take to complete the progress bar. As it also allows for comparison between users, they trigger competition and challenge, as you want to complete your own progress bar and

want to have a higher score in the leaderboard for number of views than your friends. The gamification design could use this as inspiration to visualize the main targets by a few indicators and to clearly show what can be done to contribute to the target while creating a feeling of challenge and competence.

A second studied example is the research of Minke van der Kleij concerning gamification at the mail and parcel distribution company PostNL (Kleij, 2014). For her graduation research she used dummy parcels in a parcels sorting process, which the sorting employees had to find. Her idea was derived from the mystery shoppers at stores, for which the unknown control checks and a price for a good evaluation score motivate people to perform well at their work. Her research shows that feedback is a very important element in order to enhance performances, which in her study was the mitigation of sorting errors. By providing feedback in a clear and appealing way, people feel challenged to find the dummy parcels by which they pay more attention to the sorting codes and make fewer errors. The gamification design could use this 'find a dummy' challenge in a similar way as a 'reach your efficiency target' challenge. A similar positive approach can be used to make people pay more attention to their work activities instead of pinpointing who made which error, which increased in the example the sorting errors percentage and similarly for this research to avoid pinpointing who did not work hard enough which decreased the efficiency.

A third popular example is the piano stairs developed by Volkswagen (Fun Theory, 2009). They build the piano stairs in a metro station, in order to motivate people to take the stairs instead of the moving staircase. From this example it is learned to keep it simple and fun in order to motivate people. You can tell people over and over that taking the stairs is healthier, but a fun and simple intervention actually makes them take the right action. Therefore, this gamified design could use fun and simple elements to motivate people to execute their target activities in order to achieve the target outcome, instead of trying to capture the complete complex situation at self-managing teams in the gamification design.

The fourth example came from an inspiration session of Marc Lammers, coach of the Dutch hockey team, at ING Operational Services. He compared the performance of a hockey team to self-managing teams. For instance, he mentions that in the hockey field, the goal is crystal clear: two posts and a crossbar. If you are going to play hockey without the goals, the fun quickly disappears. He also stressed that you cannot fully influence the result, because of the weather or the referee, but you can fully influence the process that prepares you for the final result. A last interesting remark is that he values the incremental process and continuous improvement, as he mentions twice times 50% is also 100%. From his inspiration session the importance of team goals, the focus on the processes instead of the end result and the aim for continuous improvement is noted that the gamification design could take into account.

The last example is a movie clip of the television program My Restaurant Rules (Mijn Tent is Top, 2010). The gamification design could use the idea of the need for an entrepreneurial mind-set at self-managing teams to make the importance clear of their quality performance, throughput times and efficiency performance. Satisfy the quality of their work, managing the inventory and managing their revenues and costs could be seen as running your own business.

6.4.2 Prioritizing Ideas

The ideas for a simple and fun intervention with incremental steps for continuous improvement of team performances, in which the target outcomes are clearly visualized and also the activities that contribute to it while feedback is provided in an appealing way, served as the basis for the ideation. The main idea of the innovation stems is to focus on the positive approach to make people pay more attention to their key activities and to make use of a 'reach your efficiency target' challenge. To make them also aware of the importance of the quality of service and inventory control, the idea of creating an entrepreneurial mind-set is used as second main idea for the gamification design. By combining these two ideas, the gamification design should create an entrepreneurial mind-set in which they have to satisfy the customer, deliver the service on time and have the challenge to be efficient in terms of costs and revenues. With this idea in mind, a brainstorm session is held to give meaning to the entrepreneurial mind-set.

6.4.3 Brainstorm Session

A brainstorm session of twenty minutes is held with the self-managing team that participates as the experimental group in the gamified intervention. The session is introduced by the designer and after a brief introduction, the team is given a slide pack of which the key slides are shown in Figure 23. The self-managing team is informed that they are the chosen team to participate in the gamified intervention. As they are appointed by higher management as the participating team, it is presented as a unique experience being the chosen team to participate.



Figure 23 Ideation Slides for the Brainstorm Session with the Experimental Group

The slide pack invites the self-managing team members to brainstorm about a business they would like to run as a team. Some suggestions were made and some images were shared to inspire them. The self-managing team could be as creative as possible and come up with any type of business. They had the freedom to choose being a restaurant, a place for horse riding, a football team, a supermarket or anything they could think of themselves. They were also given the option to stay their own self-managing team and manage their customer requests. A timer was set for twenty minutes, after which they had to have chosen a company, a company name and functions for each individual employee of the self-managing team. The self-managing team chose to be a coffee company, with special coffees like in a barista, They named their company 'Sweet Tea' and they appointed the functions of managing director, inventory manager, purchaser, bookkeeper, cashier, vendor, cleaner and coffee expert among their team members. The company type, name and employee functions served as input for the design phase, as for instance the menu of the company.

6.4.4 Storyboard Concepts

After gathering ideas innovation stems and giving meaning to the entrepreneurial mind-set by a brainstorm, a storyboard is developed. The input for the storyboard of this ideation step resulted in the concept of the gamification design and the concept for the visualization of the gamification design. For the concept of the gamification design, the two main ideas that are used are the 'reach your efficiency target' challenge and the metaphor of running your own company. Therefore, the challenge is translated to *'Running a Successful Company'* for which they have to make profit in their own company, while satisfying the customers by good quality of products and service in time. In addition, the focus in on team goals, instead of individual contributions. The concept for the visualization is focused on a fun and simple design and aims to avoid capturing all complexities that self-managing teams have to deal with in the gamification design. The target outcomes are visualized by just a few performance indicators and the activities to contribute to these performances are clearly presented and are aimed at creating a feeling of challenge and competence. Two screens are used, by which the first screen illustrated the target outcomes and the second screen presents the target activities.

The Concept of 'Running a Successful Company'

To gain a clear understanding of the efficiency target outcome, this target outcome is translated to the profitability of a company. The efficiency outcome is determined by the ratio of the normalized production and netto deployed fte. Therefore, the normalized production is translated to revenues and the netto deployed fte to costs so that the profitability is determined by the ratio of the revenues and the costs.

The normalized production is defined by a number of workflows with a production norm, which are translated to the products and corresponding prices to gain revenues from. The coffee products are defined by inspiration from online menus of coffee companies whereas the prices are calculated based on the production norms with the following calculation.

$$Price\ of\ Product\ = \frac{\left(\frac{Hour}{Production\ norm}\right)}{2}$$

To divide an hour by the production norm, it does not matter which workflow they are processing as the total per hour is always the same. Accordingly, the choice is made to divide the price by 2 to arrive at a realistic price for the products. An overview of the product and prices is shown in table 15 and to illustrate the equality of the revenues per hours the following example is given.

$$Target\ Revenues\ per\ Hour\ =\ Price\ of\ Product\ *\ Production\ Norm$$

According to the norm an employee can process 15 'Arrangementswijzingen' per hour, which makes him being able to earn fifteen times €2,00. This equals a revenue of €30,00 per hour. He can also choose to process 20 '*Customer Request*' and 5 '*Account Change*' in one hour, by which he earns 20 times €0,8 and 5 times €3,0 which also equals a revenue of €30,00 per hour. A side note, the rounding errors in this example can be resolved in the gamification design by using the original values including more decimals.

$$Total\ Revenues\ =\ Price\ of\ Product\ *\ Number\ of\ Products$$

The total number of processed workflows by all self-managing team members results in the total value for the revenues of the day.

Table 15 Normalized Production Translated to Products and Corresponding Prices

Norm	Workflow	Price	Product
10	*Example: Customer Request*	€2,0	Espresso
40	*Example: Account Change*	€2,7	Dubbele Espresso
15	*Example: Pincode Request*	€1,4	Koffie

Confidential
Dummy data

Next to the normalized production, the netto-deployed fte contributes to the efficiency. Therefore, the hours of netto-deployed fte are translated to personnel costs. The personnel costs are calculated by means of the following equation, for which the PIAT*2 is the target for production in time present, which equals the efficiency target.

$$Personnel\ Costs\ per\ Hour\ = \frac{\left((PIAT\ *\ 2) * Target\ Revenues\right)}{100}$$

By using the PIAT in the equation it is calculated that at the moment the coffee corner is at its turning point and becomes profitable, the self-managing teams have also reached their efficiency target. The target determines the percentage of the revenues they should gain, in order to be profitable. The equation is divided by 100, as the PIAT is a percentage. For example, if the efficiency target is 45,3%, the personnel costs are €27,00 per hour. This is calculated by the PIAT*2 which makes 90,6 and which on its turn is multiplied with the set revenues of €30,00 per hour and finally divided by 100.

$$Total\ Personnel\ Costs\ = Personnel\ Costs\ per\ Hour * Hours$$

If an employee is working for 3 hours, the personnel costs of €27,00 per hour of sum up to €81,00. The final calculation of the profitability is illustrated by a last example. If this employee processes a total of 108 '*Customer Request*' of €0,80 each in these 3 hours, he earns €81,00. At this moment, the coffee corner would be at its turning point of making profit, which can be calculated by the following equation for the profitability.

$$Profitability\ =\ \frac{Total\ Revenues}{Total\ Personnel\ Costs}$$

The profitability is defined by the ratio of the total achieved revenues divided by the total personnel costs. The turning point of making profit is defined by PIAT*2, which equals for the example used 90,6. The processing of 108 '*Customer Request*' in 3 hours, equals a 90,6% of the maximum of 120 '*Customer Request*' according to the set normalized production of 40 per hour. If the employee processes more customer requests than the 108 '*Customer Request*' in these 3 hours, the company makes profit. If the employees would have spent more time the same 108 '*Customer Request*', the company makes loses.

The other types of production as the non-normalized production, other production and regulatory tasks are translated to so-called cleaning tasks, which have to be done to keep the company running but from which no money is earned. As this type of production and the execution of regulatory tasks do not contribute to the efficiency of self-managing teams, and the lack of revenues should make the teams aware of what contributes to their efficiency and what does not. They should gain a clear understanding that these hours are investments in time and that they should pay attention to their scheduling.

Cleaning Tasks	To Do Tasks	Who	Hours of Cleaning
Apparaten opstarten	Control D Lijsten		
Voorraad bijvullen	Overige Productie		
Gastenboek doornemen	Kwaliteit		
Roosters maken	Management Ondersteuning		
Oefenen op Barista Specials	Opleiding		
Nieuw menu ontwerpen	Projecten		
Apparaten reinigen	Storing		

Figure 24 Non-normalized Production, Other Production and Regulatory Tasks in the Gamification Design

The quality of service and the inventory control are translated to the customer satisfaction for your own company in the concept. The quality of service is translated to the quality of the products sold, whereas the inventory control is translated to the service. The quality of the products explains that an error in processing a customer request is like serving someone weak or cold coffee, at least something that does not pleases the their customers at all. The service explains that long throughput times is like serving the coffee too late, having the customer waiting for hours for just his cup of coffee. Both the quality of products and service could make the customer complain and even never return to your company. As both the quality of service and the

inventory control are determined by a self-assessment, no consequences are linked to their performances in order to avoid strategic answers.

With the profitability, cleaning tasks and quality of service the metaphor emphasizes that you should keep your company clean and perform a variety of activities to keep the company running but the focus should be on serving and satisfying your customers from which you earn money of which you have to pay your employees. And with that, you want to end up with a profitable business. To translate these gamified activities to the real world, the self-managing teams should execute their regulatory tasks as training, quality control and meetings but the main focus should be on processing the customer requests according to the standards for quality and throughput times while also paying attention to the total deployed fte to realize this production of customer requests. And with that, they should also become focused on the efficiency performance of their self-managing team.

The Concept to Visualize the Design

The storyboard concept is based on two screens to visualize the relevant aspects of the gamification design as shown in figure 25. The main screen provides an overview of the target outcomes namely the efficiency performance, quality of service and inventory control. The input screen shows the target activities by which they can influence the target outcome. The menu is used to visualize the workflows can production norms of the normalized production. For the metaphor of running your own business the workflows and norms are translated to coffee products and corresponding realistic prices.

The payment system gives an overview of total normalized production, for which they can administrate their processed customer requests as the sold products of their own company during the day. The work schedule gives an overview of the working hours per employee and the total number of working hours. For the metaphor, these hours are translated to personnel costs and can be changed to see the effect on the profitability of the coffee corner, which represents the efficiency of the self-managing team. Lastly, the employee can define their working hours spend on non-normalized production, other production and regulatory tasks. The metaphor is used to visualize that these tasks do not contribute to the efficiency of the self-managing teams and therefore not to the profitability of the company. The hours spend on these to do tasks can explain their profitability or loss making.

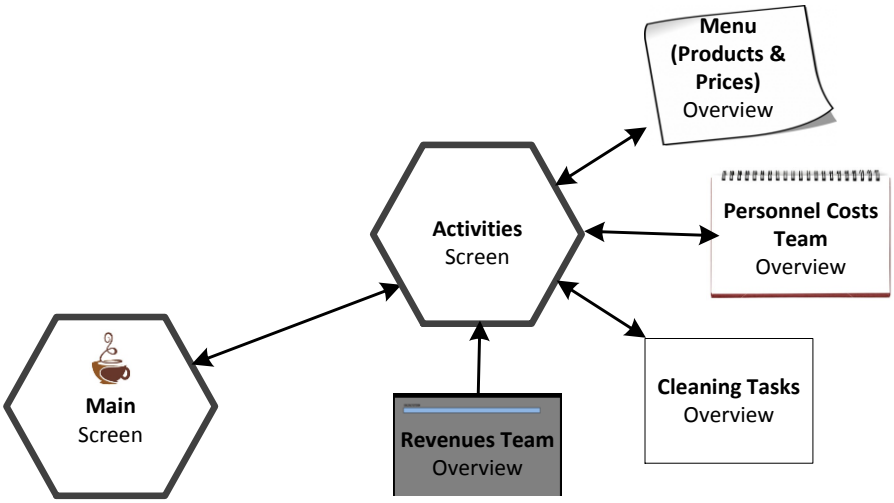


Figure 25 Screens of the First Gamification Design

6.5 Prototyping

The prototyping step is explained by an overview of the developed of the prototype and accordingly its use.

6.5.1 Build the Prototype

To build the gamification design, the spreadsheet application Excel of Microsoft Office is chosen as the modelling software that provides the development software infrastructure for programming the application. Excel is chosen because it is a common used software at enterprises and allows for calculations. Both the main screen and the input screen are programmed in a worksheet of the same workbook. Simple spreadsheet calculations are used to translate the input into output performance indicators. Users submit the start and end times of their working hours, as well as the duration of their break. Furthermore, they input their number of processed customer requests of the normalized production and the time spend on non-normalized production, other production and regulatory tasks. In addition, the self-assessment for quality of service and TITO inventory control is administrated.

By means of if-statements, the fictitious scores in terms of revenues, costs and profit are calculated automatically. The back-end of the first prototype is a basic Excel spreadsheet from which the required application input data is referenced. The Excel Application is installed at a shared file location accessible for all self-managing team members.

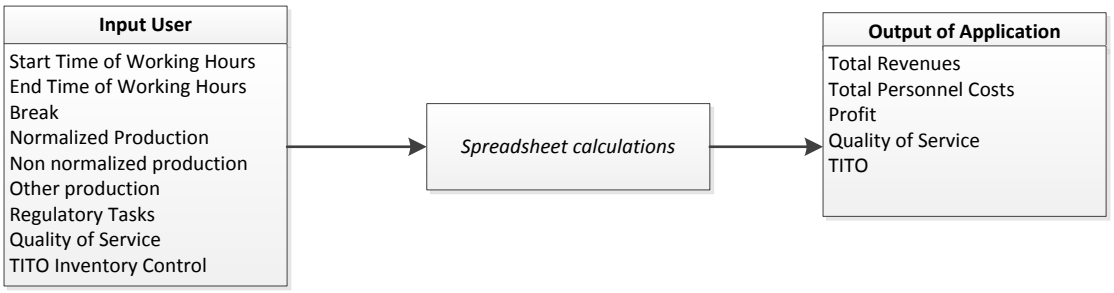


Figure 26 Input and Output Data

The design was verified by the verification steps by checking for extreme inputs and interaction moments for each sub part of the input screen and the complete design, as explained in paragraph 3.4.2 Accordingly the design was validated with the team manager of the self-managing teams and operational excellence consultants. The final design is to be shown in Figure 26 and 27,



Figure 27 Main Screen
of the First Gamification Design

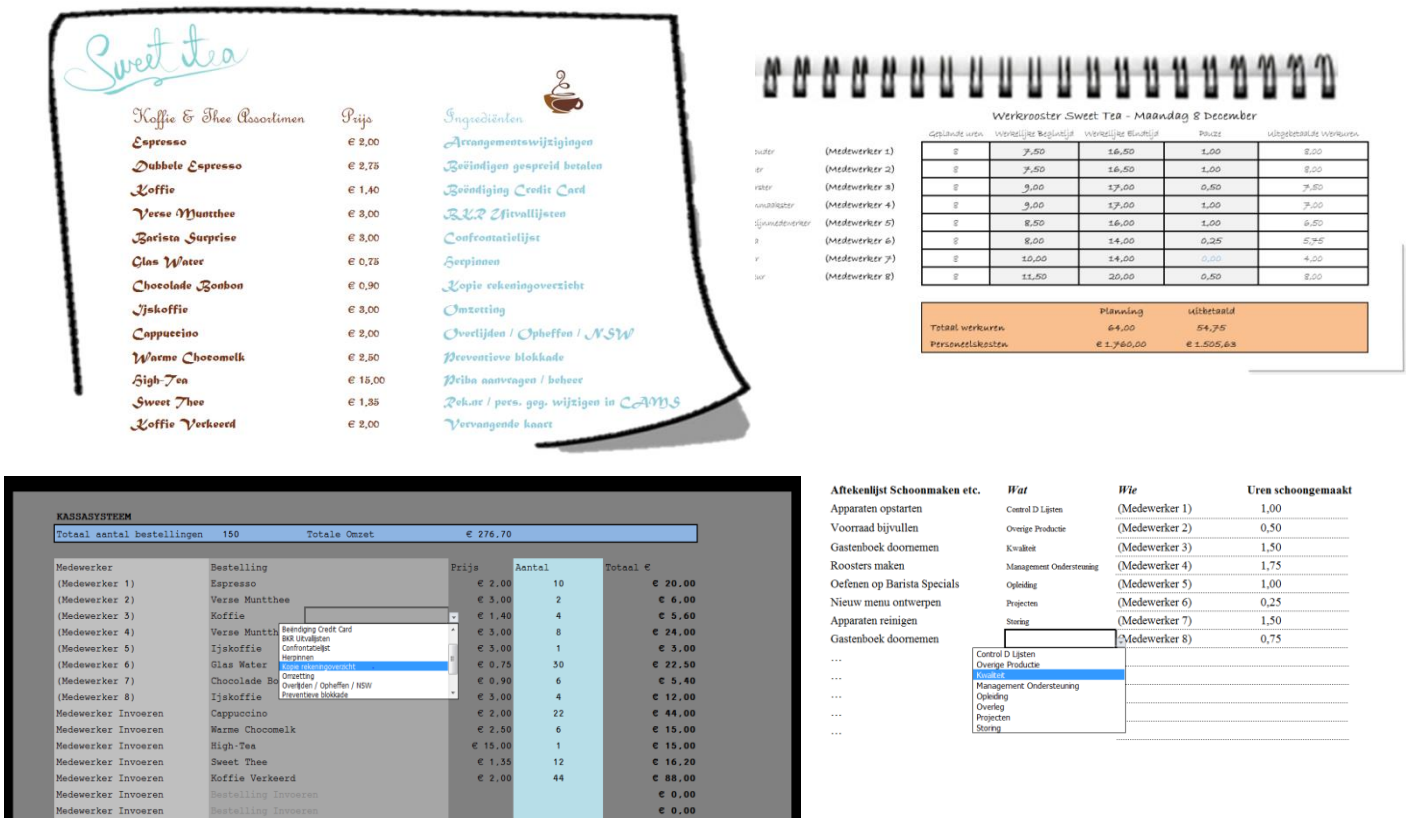


Figure 28 Activities Screen with an Overview of the Key Activities of the First Gamification Design

6.5.2 Play and Test

One self-managing team participated in the gamification intervention in week 50 and 51. By means of an intermediate evaluation and a focus group with the complete self-managing after the gamified intervention, information is gathered about the use of the gamification design as shown is Appendix CA9 and CA10.

First of all, it is important to note that the first gamification design is a basic version and an attempt is made to design the motivational affordances. The sense of competition, challenge, explore and empathize with the company was created, as the self-managing team was ready for a competition and curious to find out its working. However, as only one self-managing team participated there was no real competition. Also the challenge was limited, as the team indicated that either being profitable or not profitable did not really make a difference. This highlights the importance of the creation of motivational affordances, are just an easy and understandable interface does not energize the users to take action.

However, the first gamification design does create a more transparency about their tasks and how their performances are measured. Already early in the gamified intervention, the self-managing team mentions that in their opinion the ratio of personnel costs and revenues is not fair, as also highlighted in Appendix CA12. As this ratio equals their efficiency target they should aim to reach a profitable business. However, the team quickly understand how the profitability can be influenced as they mention in the evaluation that either the personnel costs should go down, or the prices should go up or they should process more customer requests and therewith sell more products in their own fictitious company,

In the same tone, also discussions are started about work activities that the team performs for other self-managing teams and what is defined as normalized production and what is not, as all other production besides the normalized production this does not lead to any revenues. Although this is first experienced as unfair, the team realized after an intermediate evaluation session that no matter how the gamification design values it, this

is the way their performances are measured by the organization, see Appendix CA12. Therewith, the challenge does lead to more communication and transparency. Furthermore the metaphor makes the performance easier to understand, as all day the employees are talking about costs and revenues whereas they did not talk about this previously.

However the transparency also causes some discussion within the team and mutual competition. Employees indicate that they find it hard to give each other feedback on their activities, as there is no hierarchy within the teams. Due to the transparency, self-managing team members can also compare their individual performances. Some self-managing team members indicate that they are really triggered by this kind of individual competition, while others mentioned that they have never looked to these individual scores before and are quite annoyed by it, as the whole idea behind self-managing teams concerns team performances. Therefore most of the time, one employee took control over the gamification design and filled in the activities of all self-managing team members.

6.6 Results & Conclusions

The experimental group worked with the application for two weeks from December 8th till December 19th. On beforehand, it was evaluated by the team manager and the self-managing team in the interviews sessions that these two weeks were representative for the other weeks of the year see Appendix CA5. As the gamified intervention took place at the end of the year and before the Christmas holiday, this time of the year could be of influence on the expected inflow of customer requests. However both indicated that only the week 52 and week 1 of the year were not representative, but that they did not expect any differences for week 50 and 51. The results of the gamified intervention are discussed by triangulating the results of the performance measurements and the focus group, resulting in insights in the contribution of gamification to the self-managing team performances and promising gamification design changes.

6.6.1 Analysis of the Self-Managing Team Performance

The first gamified intervention took place in week 50 and 51 of 2014. To analyze the performance data, week 45 till 49 are used as reference weeks. The performances of the participating self-managing team, the control team and the performance of Dagelijkse Bankzaken are analyzed. Dagelijkse Bankzaken exists of 46 self-managing teams and the total data of these self-managing teams is used in the performance graphs. As the main target outcome of the first gamified intervention is the efficiency target, the efficiency performances are studied by means of three types of graphs, namely the graphs for efficiency, division of working hours and the hours spend on regulatory tasks.

Figure 29 shows that in week 50 the first week of the gamified intervention, the self-managing team processed a lot more customer requests than their average as they processed all customer request of a monthly list in a few days. This is also shown by the blue bars, whereas by the orange bars it is shown that their working hours remained more or less the same. In the focus group it is also mentioned that the team started enthusiastically and processed all customer requests of a list that they normally spread throughout the month. As they finished the list, they had no more inventory to process in week 51, by which their performances declined again to their prior efficiency ratio.

As the gamification design is focused on efficiency, the self-managing team should not only look for more work to do but they should look for a good balance between the inflow of customer requests and their working hours. However, downscaling is not easily discussed in the team as this is directly reflected in the salary of temporary workers. As the gamification design provides a lot more transparency and therewith also clearly presents the dilemma of what to do when the inflow of customer requests is limited and the number of working hours is high.



Figure 29 Efficiency Performances Before, During and After the First Gamified Intervention

A closer look to the regulatory tasks of the first gamified intervention is shown in figure 30. Dagelijkse Bankzaken shows a more or less constant level of hours spend on quality control, consultation, management support and projects. The variation in regul atory task s is mainly caused by the hours spend on trainin g. The experimental group shows more variation in the hours spend on regulatory tasks. However from week 48 on, their total hours spend on regulatory tasks strongly declined. This is explained by the departure of a senior employee in their team in week 48. A senior employee has more meetings and participates in different kind of projects that are all part of the regulatory hours instead of production hours.

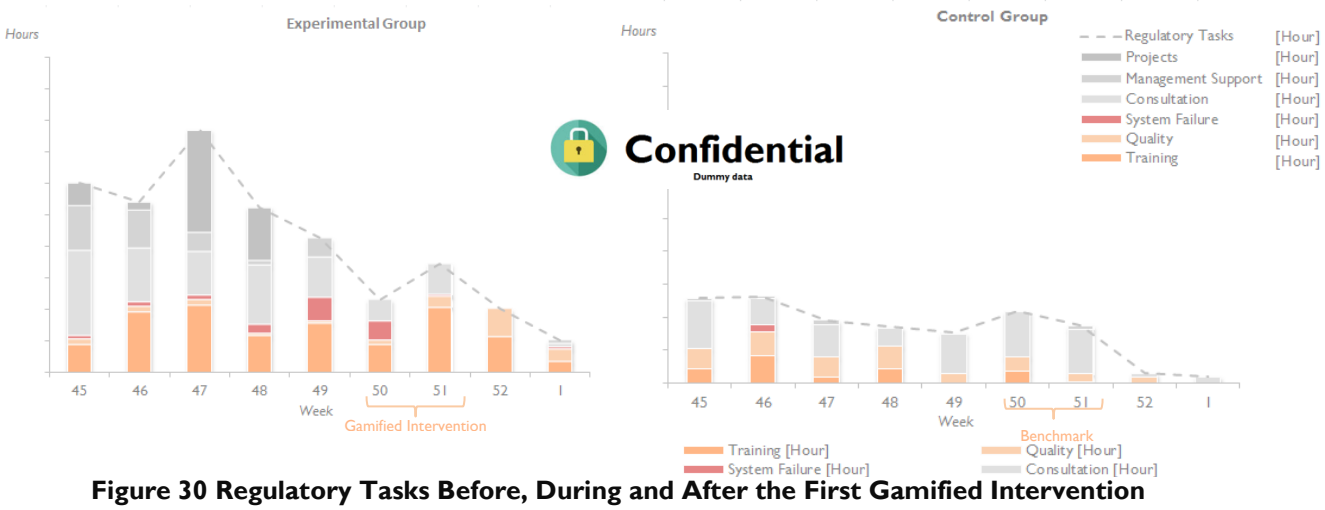


Figure 30 Regulatory Tasks Before, During and After the First Gamified Intervention

The quality performances of both the control group and experimental group are shown in figure 31 on the left hand side, whereby for the experimental group only data of self-assessments are available and for the control group only complaints from the central complaints center. The inventory control performances are shown on the right hand side. However the self-managing team indicated in the control group that they process the customer requests until 19h00 to achieve 100% today in today out, while the measurements tools take into account all customer requests that arrive until 20h00, therefore the inventory control performances are likely even higher. In the focus group, the experimental group underlined that their main focus is on working TITO.



Figure 31 Quality and Inventory Control Performance during the First Gamfiied Intervention

However from the performance analysis, it is hard to determine the contribution of gamification to the self-managing team perfo rmance in terms of efficiency, as the control group also shows fluctuations up to % efficiency per week. As by qualitative analysis, it is concluded that the gamification design did contribute to the transparency and internal team processes, it is suggested to research a gamified intervention with more self-managing teams and preferably research the gamified intervention for more than two weeks in order to gain a better understanding of the contribution of gamification. Furthermore, as the experimental group did show a decline in their performance in week 51 it is suggested to also put more weight on the customer satisfaction in the gamified design as the first gamification design only mentions it.

6.6.2 Evaluation of the First Gamification Design

Looking back at the brainstorm session to arrive at the gamification design, two lessons learned are defined for the second iteration in the gamification design process. First, it is advisable to let the self-managing team ideate their own business and ideally with all self-managing team members present. In this brainstorm session, six out

of seven team members were present, as one team member was on a holiday. During the gamified intervention, the absent team member mentioned that he felt less connected with the idea of the company because he was not present during the brainstorm. This indicates the importance of letting the self-managing team members ideate their own business, instead of just informing them they have to run for instance a pizzeria.

Next, it is advisable to have this brainstorm session with the complete team, although this requires some investment in time and therefore budget. Second, it is learned that the use of inspiration slides is perceived as very useful to initiate the brainstorm as by the slides the brainstorm can be guided but it still gives them the feeling that they completely came up with the idea of the company themselves. However, the introduction of the brainstorm session and the inspiration slides could give a bit more information and include a bit more fun in order to enhance the motivation for the gamified intervention.

From the focus group it is concluded that the participating self-managing team is enthusiastic about the first gamification design, as the mainly see the potential of its use. They indicate that the current design more or less feels like an administration office, although it stimulates them to think about ownership and having a voice in for instance the team composition. One self-managing team member even states that they all have never before spoken about participation in the decision making and also the team manager mentions that she definitely sees something happening in the team. The team mentions that they feel no ownership of the efficient targets represented by the PIAT lines, whereas by a few percentages up or down they do not change their self-management.

As the first gamification design was quite basis, a number of design changes are proposed. First of all, the gamification design should include more performance indicators next to efficiency in order to avoid that the teams aim at processing as much customer requests as possible. In the same tone it should be researched if the gamification design could also support the self-managing teams to balance their working hours instead of looking for more work. Furthermore the design should be extended with more choices, challenges, a fun and more gameful feeling and a competition between teams.

Some employees of the experimental team are motivated by the individual competition and thereby the suggestion is made to include an employee of the week price. However, as the self-managing teams should be steered by management on their team outcomes, it is also discussed in an evaluation session with Linda van Veen, team leader at the TU Delft Gamelab (Veen, 2014) how to design for team performance. From the insights of this session, on which Appendix A7 elaborates, it is concluded that it would be better to make the team members dependent on each other Therewith competition within the team is to be excluded from the second gamification design and the individual scores should not be constantly visible for the whole team.

Furthermore the design should support the self-managing teams to work with the design during the day and not only at the end of it. is advised to test for a longer period of time, as the performances of self-managing teams dependent on several external factors and therefore it is hard to determine the precise contribution of gamification to the self-managing team performance.

7. Second Gamification Design & the Gamified Intervention

The strategy of the first gamification design is mainly focused on the efficiency target. Accordingly the performance analysis of the first gamified intervention shows that this supports the self-managing teams to increase their production instead of finding the right balance between their working hours and the inflow of customer requests. As continuously increasing the production is not sustainable a sustainable way of working, the job satisfaction is added to the target outcomes of the gamification design. Job satisfaction is identified as an important performance indicator as coherences are expected for the performances as defined in managerial terms like absenteeism and quality of work (Sales, et al., 2008). As multiple forms of job satisfaction and dissatisfaction can be described, the job satisfaction types are studied in a qualitative manner (Ferreira, 2009).

Secondly, the target outcomes for customer satisfaction and inventory control are valued as more important, in order to stimulate the user to find a good balance between the quality of service, inventory control and the total netto employed fte. At the start of 2015, the normalized production and the targets are redefined and therefore a different target outcome of efficiency is set compared to the first gamified intervention.

7.1. Strategy

For the second gamification design, the target outcome and the target activities are revisited. The target users are not discussed, as self-managing teams remain the users of the gamification design.

7.1.1 Target Outcome

The strategy of the first gamification design is mainly focused on the efficiency target. Accordingly, the performance analysis of the first gamified intervention shows that this supports the self-managing teams to increase their production instead of finding the right balance between their working hours and the inflow of customer requests. As continuously increasing the production is not sustainable a sustainable way of working, the job satisfaction is added to the target outcomes of the gamification design. Job satisfaction is identified as an important performance indicator as coherences are expected for the performances as defined in managerial terms like absenteeism and quality of work (Sales, et al., 2008).

Table 16 Strategy of Second Gamified Intervention

Design Choices	
Target Outcome	Efficiency target per self-managing team (% *for Experimental Group 1,* % *for Experimental Group 2* Quality of service of % first time right Inventory control of % TITO Enhanced Job Satisfaction
Target Users	Self-managing team
Target Activities	Self-management tasks

As multiple forms of job satisfaction and dissatisfaction can be described, the job satisfaction types are studied in a qualitative manner (Ferreira, 2009). Secondly, the target outcomes for customer satisfaction and inventory control are valued as more important, in order to stimulate the user to find a good balance between the quality of service, inventory control and the total netto employed fte. At the start of 2015, the normalized production and the targets are redefined and therefore a different target outcome of efficiency is set compared to the first gamified intervention.

7.1.2 Target Activities

The target activities of the self-managing team, which is the first experimental group, did not change. However, the control group was merged with another self-managing team and due to the changes in team compositions, also four extra workflows were added to the activities of the second experimental group.

For the first gamification design, the focus was mainly of efficiency and accordingly the self-managing team only focused on their target activity to increase the normalized production. In order to correct for this behavior, as this would not be sustainable on the long term, the target outcomes of quality of service and inventory control are given more weight. The target activities for the second gamification design do not only cover increasing normalized production and decreasing the total number of working hours but also include the also support the self-managing teams to balance their working hours in such a way that they are able to process all inflow of customer requests the same day while meeting the quality of service target and work in an efficient oriented manner.

7.2 Research

To achieve the target outcomes, the target activities are operationalized as shown in figure 32. Therewith self-management of the flexible workforce is of higher importance, whereas they can ask the team manager for support if they are expecting to come in trouble with their inventory control targets.

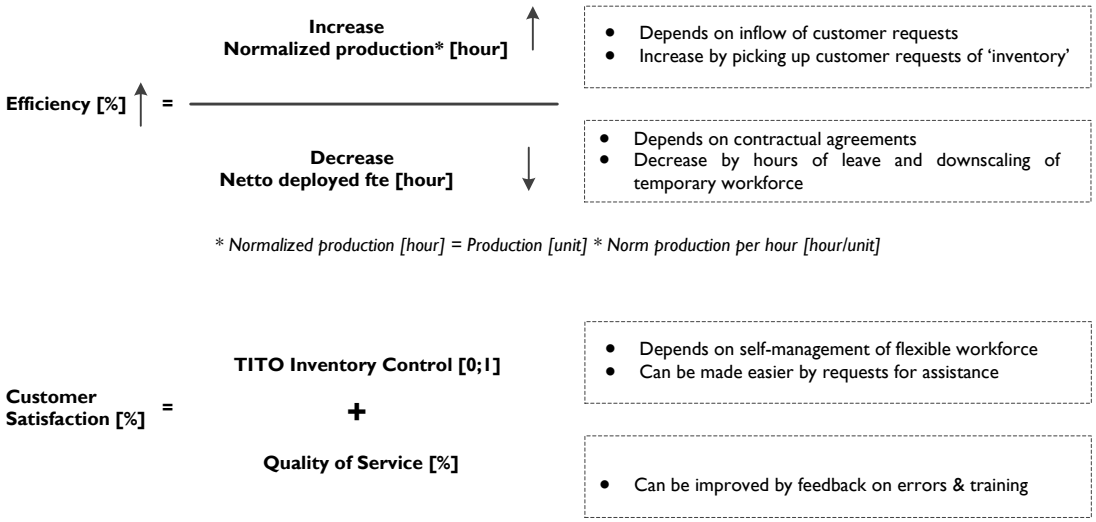


Figure 32 Target Activities that Contribute to the Target Outcome of Efficiency and Customer Satisfaction

To achieve better self-managing team performance, the self-managing team should gain even more insights in their performances and their actions to affect these performances and therefore several supporting activities are defined accordingly to the gamification design process. To be more efficient, a supporting activity would be adapting the working hours to the inflow of customer requests as this inflow cannot be influenced. A second supporting activity is to schedule the training and consultation properly, in order to meet their daily efficiency target, quality of service and inventory control. Next to being efficient, the focus is on continuous improvement. Therefore, the team should be aware of their quality and inventory control. A support activity to gain these insights is to perform quality checks and TITO checks. Another supporting activity of continuous improvement is training, as more skilled employees increase the flexibility in capacity of the self-managing team. Lastly, it is uncovered in the explanatory study that both being efficient and focus on continuous improvement is preconditioned by the communication between the team members and transparency in tasks.

Although the general activities are not changed, self-managing teams also have to take into account the skillfulness level within their teams, while managing the inflow of customer requests, controls and resources in such a way that they achieve the target outcomes. By training, the errors and therewith the quality of service can be improved. There is no specific target for the skillfulness level, as the self-managing teams should make the trade-off between the time spend on training hours and the level of all-round employees and skillfulness in their team. Hours spend on training can be seen as an investment as these hours do not contribute to their efficiency on the short term.

7.3 Synthesis

For the synthesis, more attention is paid to the design for competition, challenge, empathize and explore. A competition is set up between the self-managing teams the sub-division. The competition is among the title of most successfully entrepreneur of the two-weekly intervention. The teams are confronted with a challenge, which is to have a successful day in their company. Therewith, successful is defined as having all customers satisfied and served on time. This is measured by quality and TITO checks, although it has been placed in a

metaphor. However, the challenge is two-fold. Next to the customer, they have the aim to more profit. If for a day the customers are completely satisfied and they made a profitable day, they earn a ticket. As the gamified intervention is set for two weeks, ten tickets are available per team. At the end of the gamified intervention, the tickets are used in a lottery. The more tickets they have, the more chance they have to win the competition from the other team and go home with the unknown price. The price is nine tickets, for the whole team including the team manager, to an official football match between The Netherlands and Turkey.

A reward is included as it is said that it has a strong effect on the motivation. Furthermore, to include the rewards also the effect could be evaluated. Lastly, a reward would make a competition more meaningful. Next to the competition and challenge, the motivational affordances of empathize and explore are coupled to the work activities of self-managing teams in order to contribute to the target performances. To empathize, more attention is paid to the narrative and to express their activities by the metaphor of running their own business. As it is easier to empathize with profit and losses than the efficiency PIAT target and norms, this is used to translate the efficiency performances of self-managing teams. Lastly, the teams should explore more functions to steer their performances during the intervention. This is done to keep them curious for the next functions and to keep them engaged. In the basic version the profitability and customer satisfaction should be included, whereas extensions can be made to include a possibility to leave notes to each other.

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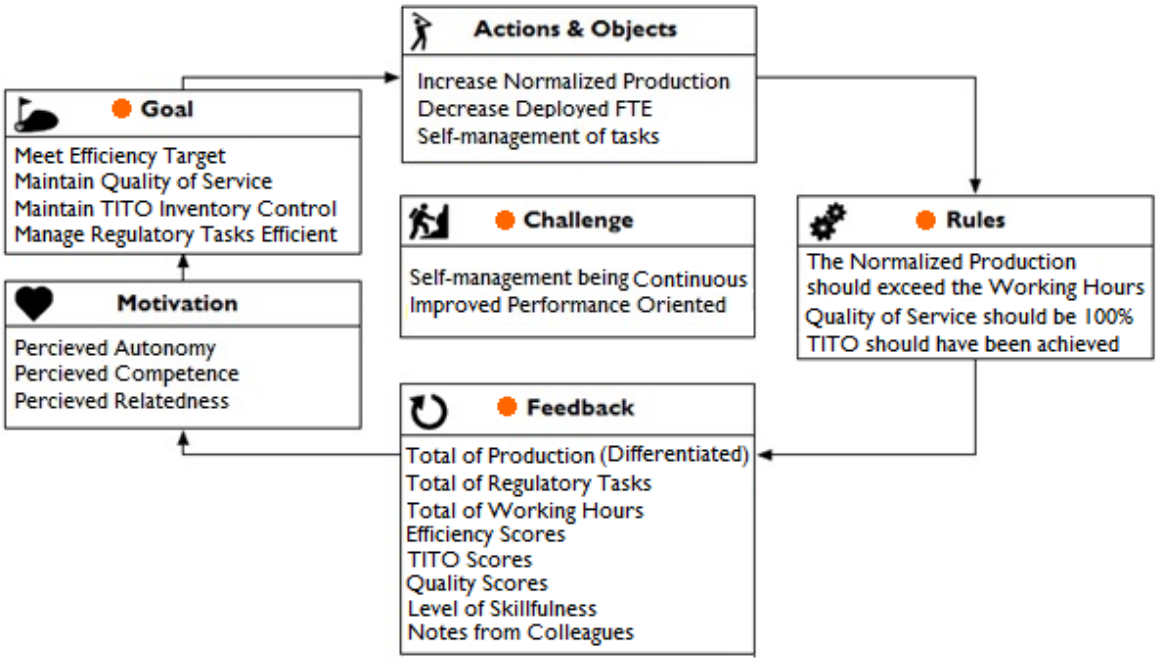


Figure 33 Skill Atoms of Self-Managing Teams for the Second Gamification Design

For the second gamification design the skill atoms of the self-managing teams are revisited, for which the changes are highlighted by the orange dots in figure 33. For the goal, also the efficient management of other

regulatory tasks is added. The rules for quality of service is not only mentioned, but also valued by a needed [redacted]% score. The same counts for TITO inventory control, which is valued by its achievement of the previous day as they only know their TITO inventory control at 19h00. To be able to steer on performances, more feedback is provided to the self-managing teams by their level of skillfulness and notes from colleagues in the second gamification design. Lastly, the challenge of the gamification design is no longer just focused on efficiency, but is adapted to a focus on the continuous improvement of the self-managing teams.

Next to the skill atoms, the second gamification taken into account the four motivational affordances of compete, challenge, empathize and explore. The competition is designed between two teams, by which they can win a ticket on a daily basis for the lottery at the end of the competition. The game element of the reward system by a lottery shows that game elements can be used to support multiple motivational affordances, as it is also used to support the daily challenge of being profitable while keeping the customer satisfied. The motivational affordances of empathize is mainly supported by the game element of a storyline with the metaphor of running your own business. Therewith, communication and a good ambience are to be supported in the team. Lastly, the users can explore unlocked functionalities in the gamified intervention to motivate the users by Explore.

7.4 Ideation

Brainstorm Session

For the second brainstorm sessions, the lessons learned from the first case study were taken into account. Accordingly, two main parts of the kick-off were worked out more extensively. The brainstorm sessions started with a more elaborate introduction with an inspiring clip of 'My Restaurant Rules'. From the first case study it was concluded that a food and / or beverage company was very useful as a metaphor. Therefore, the self-managing teams were asked to think of their own company in this sector instead of giving them also the freedom to think of their own clothing label for instance.

The second gamified intervention is introduced by a brainstorm session per self-managing team. During this session, the four motivational affordances are explained. First the competition, the self-managing teams are told they were elected as one of the teams to participate in a competition for entrepreneurs. They are informed about the number of participating team and the duration of the competition, namely two weeks. Second, the challenge is explained which they have to master. For the company the focus is twofold, you want satisfied customers and a profitable business. For each day their customers are completely satisfied ánd they make profit, they master the challenge and are awarded with a lottery ticket. Third, the storyline of having your own company is stressed.

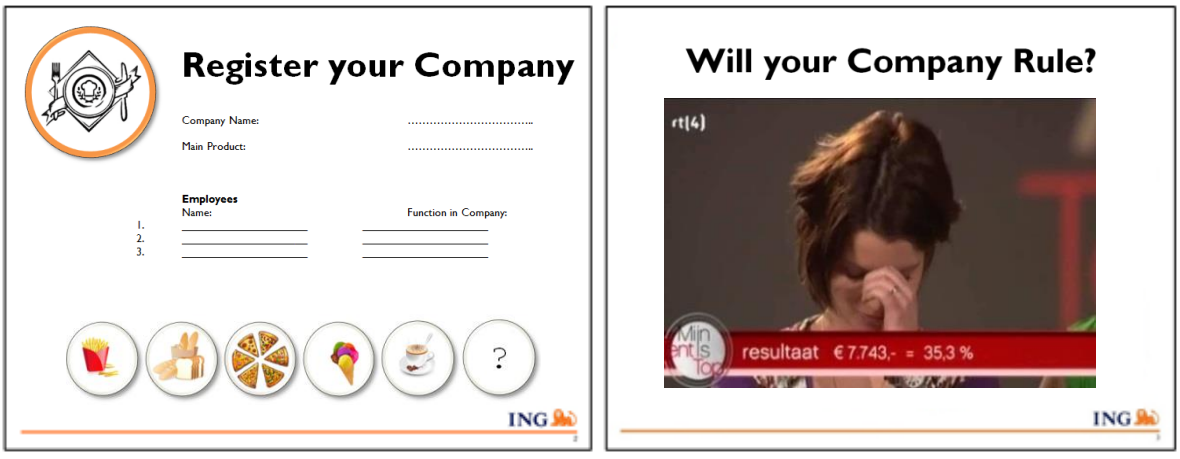


Figure 34 Ideation Slides for the Improved Brainstorm Session with the Experimental Groups

To empathize, clips from the television session of my restaurant rules are shown. In these clips, the owners have little knowledge about their restaurants, which evokes the suggestion that their business result is a lottery and elicits the response from the team they could do it better. Fourth, curiosity is created by giving them limited information about the functions of the application and to inform them about the daily tips that will be given about the award. A few functions of the application will unlock during the two weekly intervention, by which they will gain more insights or which stimulates the fun experience.

Next to the introduction of the gamified intervention, the self-managing teams are asked to ideate their own company. For inspiration, a few suggestions were made about companies related to food and beverages. The advantage of the metaphor of a food and beverages company is that it supports the in-house production, that customers are able to test both the product quality and delivery of service and that customers are likely to write a review, to give a tip of to refuse payment if they didn't get the right product or a product of bad quality.

In total four kick-off sessions were held with four self-managing teams. The self-managing teams were asked to fill in the register form as shown below to apply for the gamified intervention. This resulted in a bakery 'De Misbaksels', a coffee corner 'De Oranje Koffiecorner', a shop for pie and cake 'De Oranjekoek' and the coffee company or barista 'Sweet Tea'. The team that participated in the first case study wanted to maintain their business, as they indicated they were all familiar with 'Sweet Tea' and were proud of their company.

Storyboard Concept
For the second gamification design, the two screens of the first gamified intervention were extended with many other screens to not only represent the costs and revenues, but also present overviews for training and notes regarding the best practices of their work day for example, which could be added to the daily performance report which is registered from the gamification. The screens to be developed are shown in figure 35, on the next page.

The main screen provides an overview of the target outcomes namely the efficiency performance and customer satisfaction, whereas the customer satisfaction is determined by the quality of service and inventory control. The input screen shows the target activities by which they can influence the target outcomes. The main screen and the investments screens are used to provide an overview of the main activities, whereas the investment are activities that do not contribute directly to the profitability and customer.

7.5 Prototyping

The second gamification design taken into account the revised design steps for prototyping. Therewith, it aims at addressing the drawbacks of the first gamification design. To explain the second gamification design, an overview is given of the technical development and its use cases.

7.5.1 Build

For building the prototype, technical and visual design choices are made.

- *Visual Design: Development Platform and Data Management*

To develop the application and to store information, several technical design choices are made. The development platform, compatible programming language and database are chosen. To choose a development platform the four well-known platforms of Microsoft Office, Game Engine Unity, Adobe Flash Player and the World Wide Web are considered. Only well-known platforms are considered as due to their widespread use high level documentation and support are available. For this research, Microsoft Office Applications are chosen as the development platform for the gamified application, for which Appendix A8 substantiates the technical design choices.

The office software developed by Microsoft, is a widely used office software and is also in use by ING. For the gamified application the most interesting applications are the electronic spreadsheet application Excel and the

relational database application Access. This allows for calculations and data management and can be linked with existing relational databases of ING in Access. As the application of Excel allows for more creativity, the screens of the application are developed in Excel. Although this software package facilitates calculations, data management, easy acceptance and use, it also limits flexibility and creativity and therewith room for a gameful experience. However, the programming language Visual Basic Applications and User forms enable the designer to build a customized application that still supports a gameful experience.

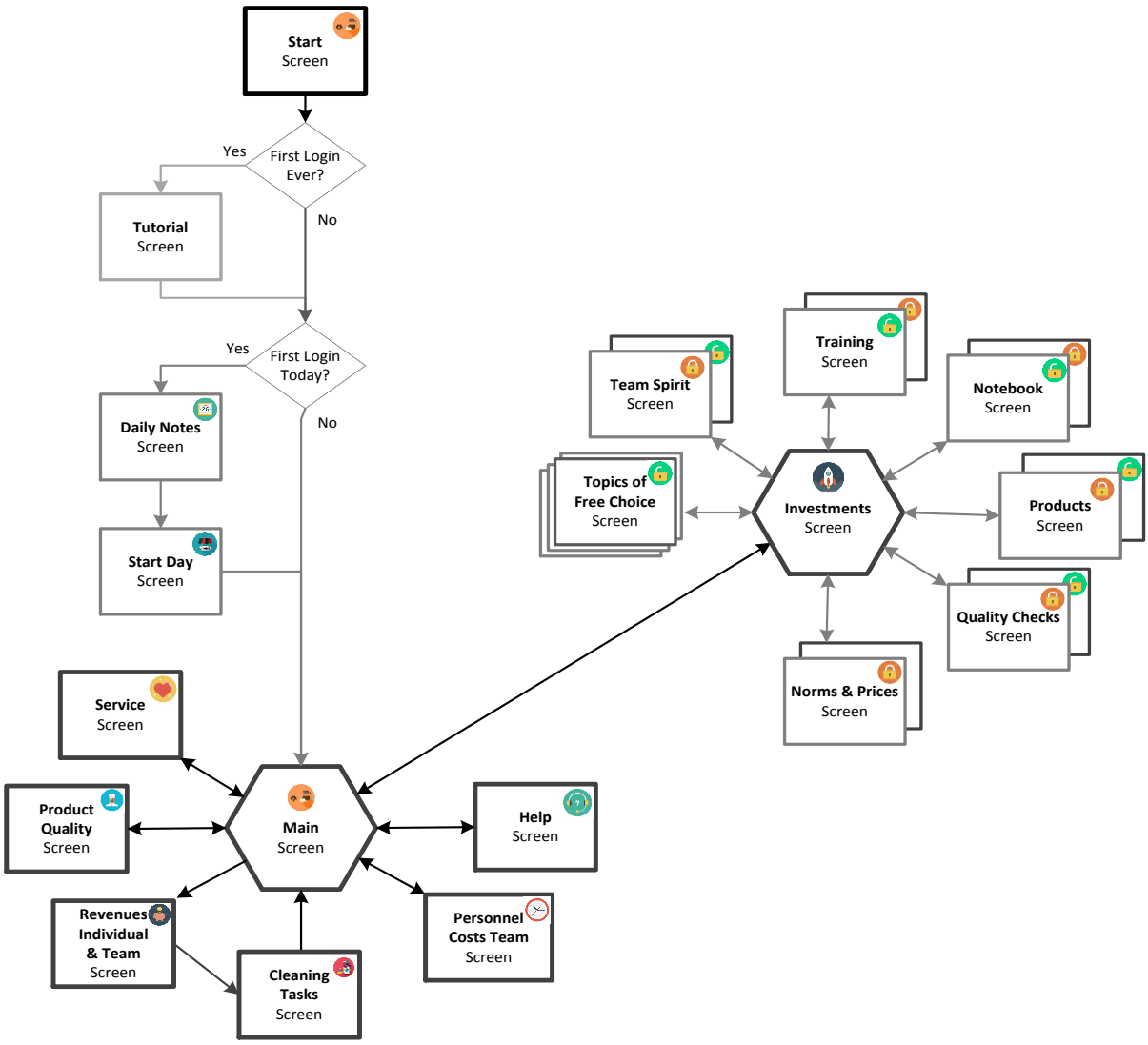


Figure 35 Screens for the Second Gamification Design

The data management application Access could function as a useful back-end of the application and this is researched for the development of the prototypes. Ideally, the data from the Excel screens could be linked with and stored in an Access database. Considering the amount of data to manage as shown in Figure 36, this is still manageable in an Excel spreadsheet. Therefore, it is faster and easier to use an Excel spreadsheet for the data management instead of building an Access database.

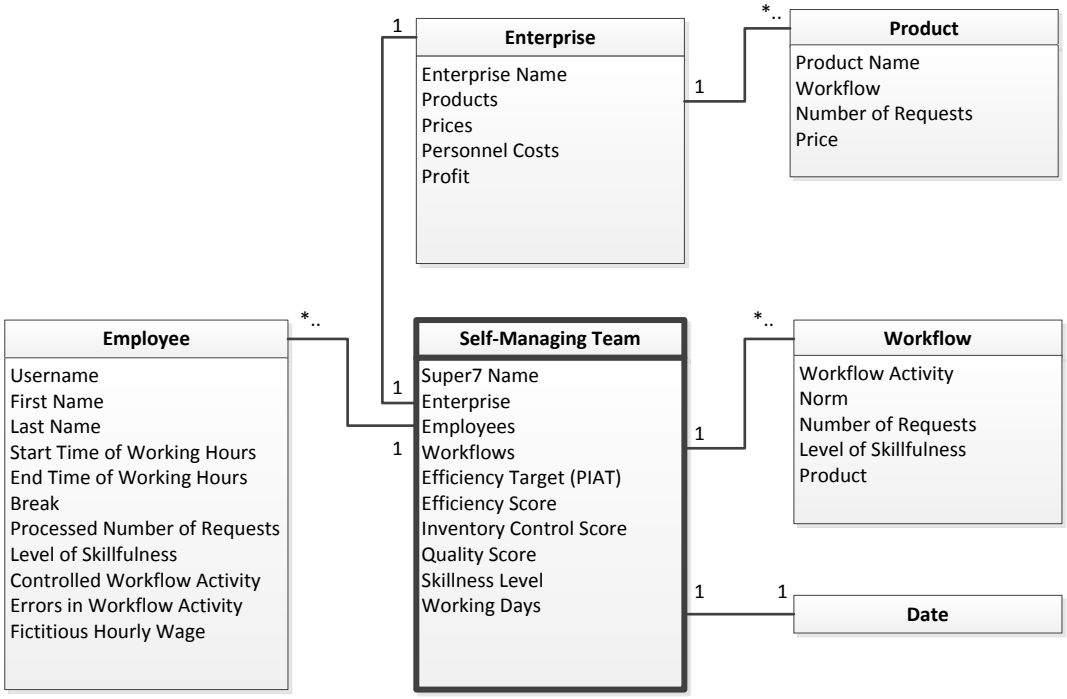


Figure 36 Relational Data

As Excel is a single user application, problems occur if more than one user is active in a file. Excel has an option to share the workbook with other people, however this does not work in combination with the Visual Basic Programming code. Therefore the data information needs to be written to a temporary file, from which the team data can be loaded. If the user makes changes in the application, a secondary file should be opened for a short notice, save the changes and close. Accordingly, if the team file stays active, it can synchronize with the temporary file once it is closed. Without the temporary file, conflicting write and reading rights will trouble the data synchronization.

- *Visual Design: Professional Look & Flat Icons*

From the exploratory research, the self-managing team members indicated that it would be nice to have a more gameful experience as the first design to some extent felt like an administration tool. Therefore, the design choice for the visual design is a very important aspect. A wide variety design styles exist, for example cartoonish, pixel art or futuristic design. As the application is designed for a professional organization, a fun but professional style is looked for. The choice is made to make the design flat icon centered. In the exploratory study it is clarified that the design should make clear what the key targets and main activities are to contribute to this target. Flat icons are suitable to express these main activities, by keeping the rest of the design simple to not distract the user from the key information. The gamification design can be adapted for each self-managing team of which four examples are shown in figure 37, which were the result of the four brainstorm sessions.

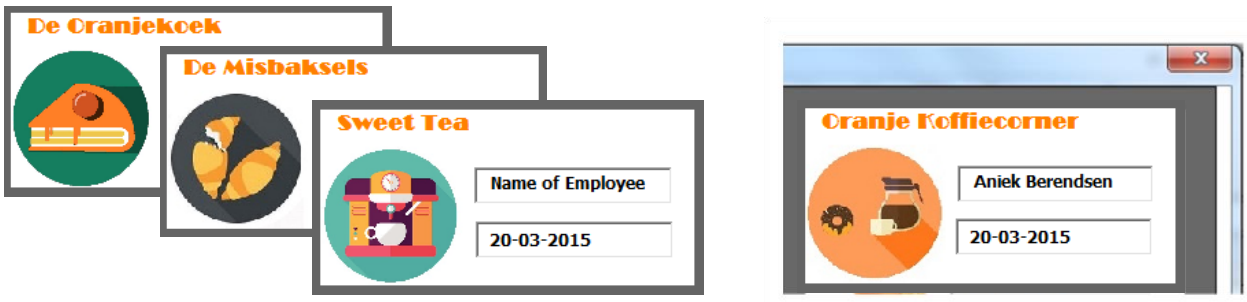


Figure 37 Four Fictitious Companies for the Gamification Design

7.5.2 Play and Test

Due to some changes in the sub-division, the companies of 'De Misbaksels' and 'De Oranje Koffiecorner' were merged and the company 'De Oranjekoek' dropped out. Therefore only the two experimental groups participated and therewith their companies 'Oranje Koffiecorner' and 'Sweet Tea. Preceding the gamified intervention, the gamification design is validated with the COO of ING Domestic Bank and the directors of Operational Services, Dagelijkse Bankzaken and Specials, see Appendix CA11. The higher management was really enthusiastic about the gamification design. One key point of feedback was to change the challenge in such a way that the challenge is to be profitable each day, but one a ticket can be won if they kept their customer satisfied. Furthermore, the COO challenged the researcher to put up a larger competition in the company, perhaps after the research. Some skeptics were to be found regarding the coffee company, as this was considered to be a bit boring. This highlights the importance of the brainstorm to come up with your own company, as this is a very subjective opinion which has a large influence on the enthusiasm to start the gamified intervention with.

For the use cases, the use by either new or experienced teams, the role of the team manager and the potential use for the long term are explored. Appendix CA12 gives an overview of the three focus groups, by which the rich qualitative information is gathered. By means of the quantitative data, it was expected that the gamified intervention would be more suitable for experienced teams. However the teams themselves indicate that it is very relevant for self-managing teams of all maturity levels. For new teams, a more basis version could be used to gain a good overview of all relevant activities and the key outcomes they contribute to. It is suggested that experienced teams could use the unlocked screens and even add screens themselves and accordingly really use the gamification design as a tool that covers all the relevant aspects of their strategy to achieve the target outcomes. Furthermore it is argued by team managers and higher management that they also see the potential of the same tool for other complexities that self-managing teams might have to deal with by for instance just changing indicators or weights in the design.

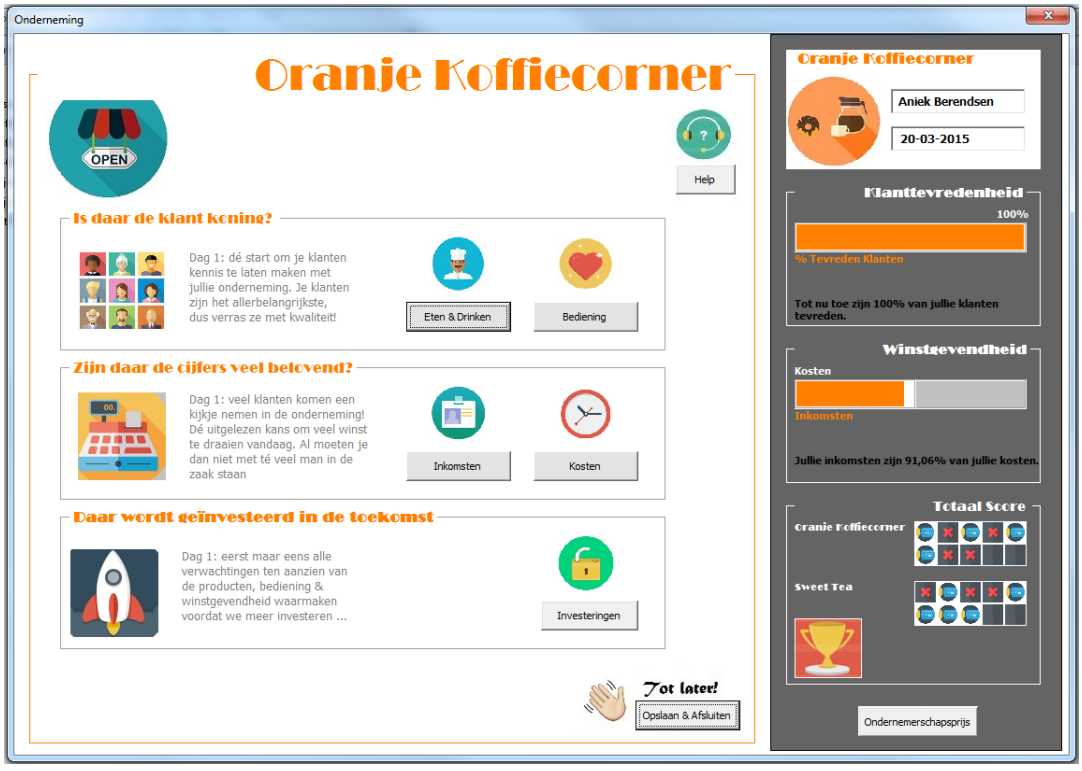


Figure 38 Main Screen
of the Second Prototype of the Application

Regarding the role of the team manager, this role depends on the maturity and enthusiasm of the team. If no one in the team is enthusiastic at the start, the team manager could support them by asking challenges and showing the self-managing team its use and potential. It is interesting to note that the experimental group 1 mentioned that they would not recommend a larger role for the team manager, as they were already more experienced and enthusiastic whereas the second experimental team clearly stated this is one of the success factors. The team managers themselves argued that they would like to be involved from the start, in order to challenge the self-managing teams for continuous improvement and also share the fun and positive aspects of the gamification design.

For the long term, both self-managing teams indicate that they would like to continue to use the gamification design. However, it is also mentioned that the prototype has some technical drawbacks and for a widespread use throughout the organization it is useful to first see if the design could be connected or partly integrated into existing databases. Although they would like to use the tool for the long term, it is also mentioned by both the teams as higher management that it is likely to use the metaphor of a company at the start but that it is also preferable to go back to the normal workflows after four week or so.



Figure 39 A Few Selected Activities Screens, which Illustrate the Key Activities

Regarding the role of the team manager, this role depends on the maturity and enthusiasm of the team. If no one in the team is enthusiastic at the start, the team manager could support them by asking challenges and showing the self-managing team its use and potential. It is interesting to note that the experimental group 1 mentioned that they would not recommend a larger role for the team manager, as they were already more experienced and enthusiastic whereas the second experimental team clearly stated this is one of the success factors. The team managers themselves argued that they would like to be involved from the start, in order to

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For the long term, both self-managing teams indicate that they would like to continue to use the gamification design. However, it is also mentioned that the prototype has some technical drawbacks and for a widespread use throughout the organization it is useful to first see if the design could be connected or partly integrated into existing databases. Although they would like to use the tool for the long term, it is also mentioned by both the teams as higher management that it is likely to use the metaphor of a company at the start but that it is also preferable to go back to the normal workflows after four week or so.

For the second gamified intervention, only a limited number of possible activity screen are included, of which a few examples are shown in figure 41, in order to avoid the users being overwhelmed with possible functions. Due to its limited use, other ideas are translated to possible extensions. also some extensions are characters are best suited for the users to project themselves into. During a brainstorm session with four self-managing teams, all teams were asked to come up with a company name, product and to come up with a role for each employee in their chosen company. This brainstorm session resulted in a variety of characters, as among others the managing director, vendor, accountant, and cashier. The results of the brainstorm session are to be found in Appendix CA9.

Currently, only a team avatar is used in the application, which represents the fictitious company. Individual avatars could be included in order to personalize the application. The choice for a type of avatar could be a character, which could be visualized by a cartoon, icon or any other creative design. Another option would be a profile picture. It is advised to include the profile picture as an avatar, as the application is used in a business environment. A second and secondly, as it also supports employees to have a contact picture for other internal communication systems of the organization.



Figure 40 Extension for Avatars or Profile Pictures

Employees of ING have the opportunity to upload a profile picture for the internal network systems like intranet, Microsoft Office Outlook and Lync application. Not all employees are uploading a profile picture, which might be their preference or might be the consequence of their lack of knowledge on how to upload a picture in the system. Displaying a picture of the sender or recipient could enhance the feeling of personal contact, both in the internal systems of ING as in the developed application.

A second extension to the developed application is to implement an integrated link with the outlook agenda of self-managing teams. This might be useful as the application also intends to support the self-managing teams in the management of their activities. It could support a self-managing team member to easily schedule a short team meeting or stand-up and send all team members a meeting invitation and reminder. Such a meeting could be scheduled, if for instance the employee would like to discuss if they should upscale or downscale, based on their insights in the process work volume due to the application and their expectations regarding the inflow for the rest of the day.

7.6 Results & Conclusions

By iterative prototyping, the first gamification design is improved by walking through the five design steps of strategy, research, synthesis, ideate and prototyping for a second time and to revise these steps were necessary. The second gamification design is used in another gamified intervention of four weeks with two participating self-managing teams of ING Operational Services. This paragraph discusses the results of the gamified intervention and accordingly concludes to which extent the desired outcome is achieved.

The aim of the gamified intervention is to support self-managing teams in customer focused and efficient self-management of their tasks. In order to evaluate to which extent the gamified design has contributed to efficient way of processing customer requests while meeting the standard for quality of service and inventory control, the quantitative data is studied. Accordingly, the results from the evaluation sessions are used to triangulate the results from the performance measurements, motivational needs, job satisfaction survey and evaluation survey with the qualitative data from focus groups with both self-managing teams, the team leaders of Dagelijkse Bankzaken and the management of Operational Services. Resulting in conclusions regarding the self-managing team performance and an evaluation of the second gamification design.

7.6.1 Analysis of the Self-Managing Team Performance

In February 2015, two self-managing teams participated in the gamified intervention of four weeks. In advance the research period was set to two weeks, after which the participants were asked to fill in the job-satisfaction, motivation needs and evaluation questionnaires and a de-briefing and evaluation session was held. Moreover the team manager was instructed about the support a team manager could give to the self-managing teams by making use of the designed application. Accordingly, both self-managing teams choose to continue to work with the gamified intervention being supported by their team manager for another two weeks.

Efficiency Performance

The efficiency performances of the two self-managing teams who participated in the gamified intervention are studied next to the performances of 46 self-managing teams of the division Dagelijkse Bankzaken in order to benchmark for changes in the environment. The metrics used are explained in more detail in chapter 4.

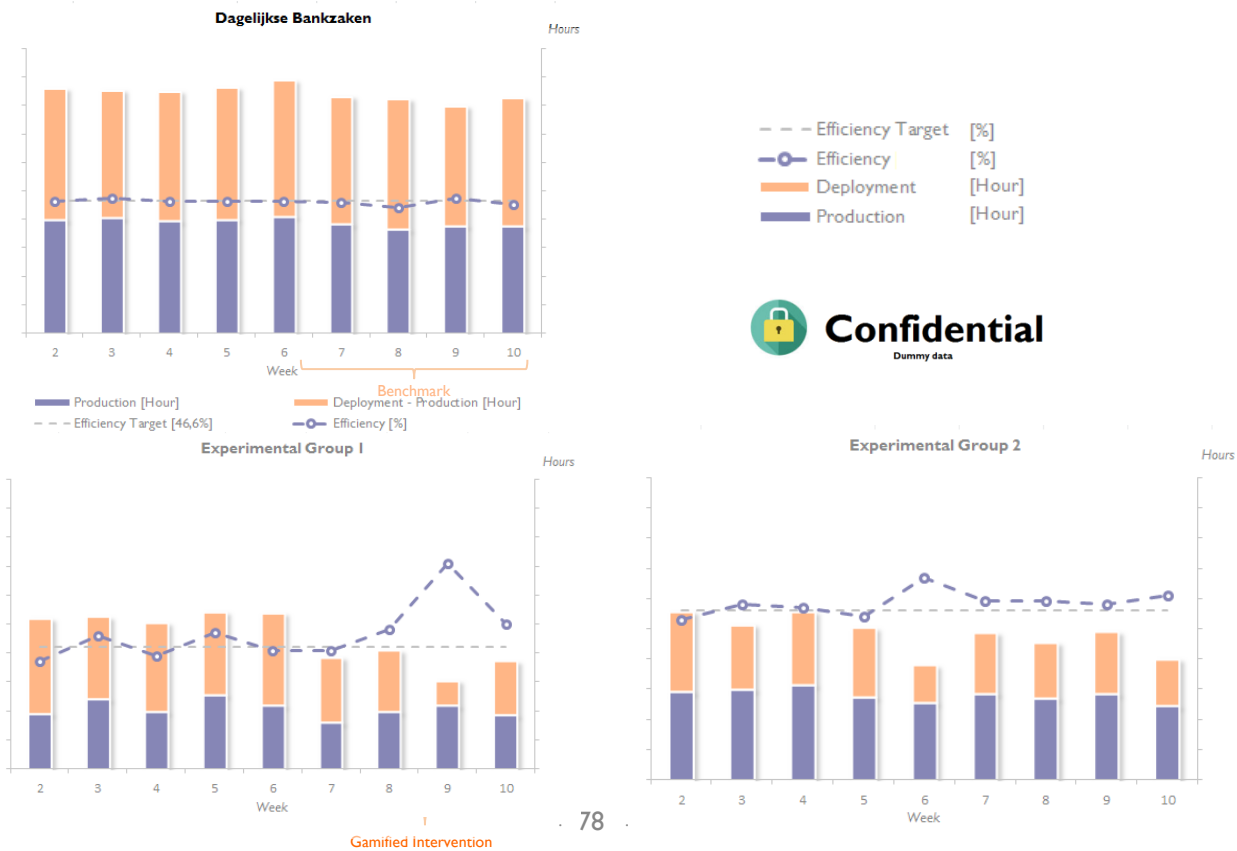


Figure 41 Efficiency Performances Before and During the Second Gamified Intervention

The efficiency performances are valued as the achieved efficiency score with respect to their target efficiency score, as visualized in figure 41. For the efficiency target, the targets for April 2015 are taken into account. These targets are respectively [redacted]% for Dagelijkse Bankzaken, [redacted]% for the first studied self-managing team and so-called experimental group 1 and [redacted]% for the second studied self-managing team or experimental group 2. The achieved efficiency scores are visualized by a blue dotted line, the target efficiency scores by a smaller horizontal dotted line. Week 2 till week 6 is the baseline scoring whereas the scores in week 7 till week 10 show the performance scoring during the gamified intervention. The efficiency is the ratio of the production expressed in production hours and the netto deployed fte measured in working hours. The blue bars represent the total production hours per week which fluctuate per week. The orange bars represent the total number of working hours per week, which also fluctuate per week as the self-managing teams should adapt their working hours according to the inflow of customer requests.

The four weeks of the gamified intervention can be compared to the weeks in the baseline measurements as the performance of the self-managing teams of Dagelijkse Bankzaken do not show any inconsistencies. Therefore, it can be concluded for the efficiency performance that the first experimental group shows an increase in efficiency performance and performs far above target during the weeks of the gamified intervention. This improved efficiency performance is mainly realized by decreasing their total number of working hours, as the production is more or less equal to the baseline measurement. The second experimental group shows a more constant efficiency performance. However they also decreased their total number of working hours and therewith increased their performance with the few percentages needed to constantly perform above target during each of the four weeks of the gamified intervention.

Efficiency Performance of the First Experimental Group in Detail

A more detailed overview for the first experimental group is provided by analysis of the daily performances during the four weeks of the gamified intervention. Figure 42 shows the performance of the first studied

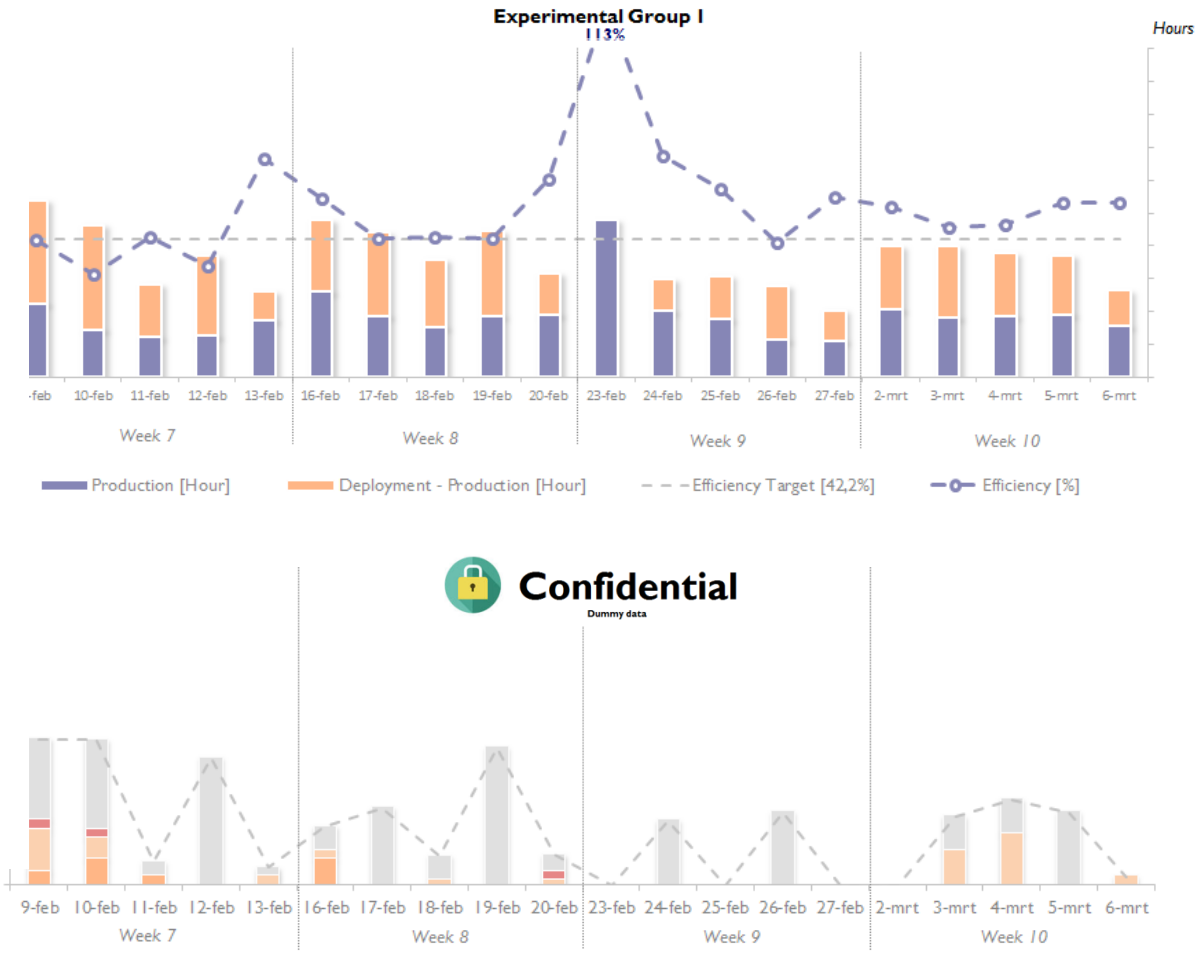


Figure 42Efficiency Performance per Day of the Intervention for the First Experimental Group

self-managing team. The first graph shows the efficiency performance, whereas the second graph shows their time spend on regulatory tasks as among others training and quality control. Over the four weeks, a steady increase in efficiency performance is to be noted. In the first weeks the team performed twice below target, whereas in the last two weeks they performed far better than their efficiency target of 42,2%. Also three remarkable outliers are noted, as on February 13, 23 and 24 the team performed extremely well. Furthermore a clear trend per week is to be seen. On Mondays, the have the largest capacity in workforce but also produce the most daily production. On Fridays they have in general the smallest capacity available and also Wednesdays are less occupied which is in line with their production on these days. The self-managing team spends minimal time on regulatory tasks on these three days and the second graph of figure 42 shows that the team schedules most of their meetings on Tuesdays and Thursdays as illustrated by the grey bars.

Performance of the Second Experimental Group in Detail

The efficiency performance of the second self-managing team during the four weekly gamified intervention is also analyzed. Over the four weeks, a fluctuating performance is to be seen as illustrated in figure 43. In

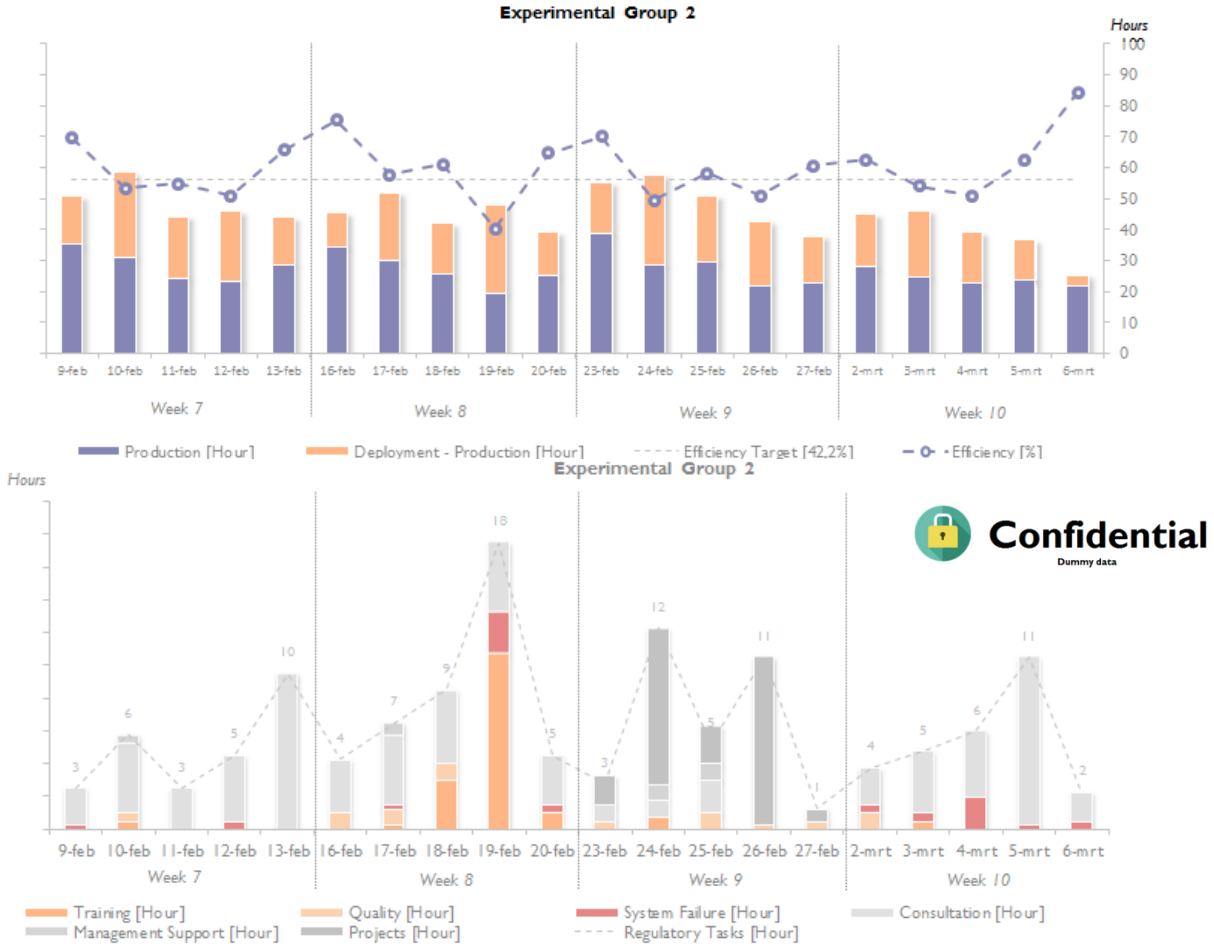


Figure 43 Efficiency Performance per Day of the Second Intervention for the Second Experimental Group

general, the self-managing team performs quite well with respect to their target and not meeting their target can mainly be explained by their time spend on regulatory tasks. Three clear examples are the regulatory tasks on February 19, 24 and 26. On these days, they spend a large number of hours on extra training and projects and in the first graph it is shown that on these days the self-managing team also performs under target. Over the week, two trends are noted. First, in contrast to the first experimental group the second team has not a lot more people employed on Mondays than on the other days of the week although they do process a lot more customer requests on this day. Second, they have less people employed on Friday compared to the rest of the week, resulting in high efficiency scores in general for Mondays and Fridays. Similar to the first experimental group, also the second experimental group schedules most of their regulatory tasks on Tuesdays and Thursdays.

Quality Performance

The quality performance is more difficult to measure, as both self-managing teams have their own way to measure their quality. The first experimental group determines their quality of work by self-assessment. One member of the self-managing teams reviews a number of processed random customer requests and checks their quality. The number of checks and the number of errors are documented as shown in figure 44. The second experimental group uses the customer complaints from the central complaints administration of ING Operational Services, of which they receive an overview of the kind of complaints. However, both measurements give an indication of the quality performance, although both measurements have their limitations as explained in chapter 4.



Figure 44 Quality Performances Before and During the Second Gamified Intervention

During the gamified intervention, the first experimental group did not measure their quality in weeks 8 and 9. However, they checks a lot of customer requests in week 7 and also performed a number of checks in week 10. The number of errors found was relatively low. For the second experimental group, no data was yet available regarding the customer complaints of March and therewith no data is shown for week 10. Their quality measured by the number of complaints does not show any remarkable changes. Therefore with some caution, it can be concluded that it looks like the gamified intervention does not has a large impact on the quality of service.

Inventory Control Performance

The performance for the inventory control of the two self-managing teams is valued by the ratio of customer requests processed on the same day of arrival, according to the TITO principle. Figure 45 gives an overview of the number of customer requests per studied self-managing team that are not handled on their day of arrival per week. As the self-managing teams process about 1000 customer requests per day, the number of not TITO processed customer requests is only a small percentage of their total daily inventory. One remark, only a part of the total workflows are shown in both graphs as for the other workflows no data is available.

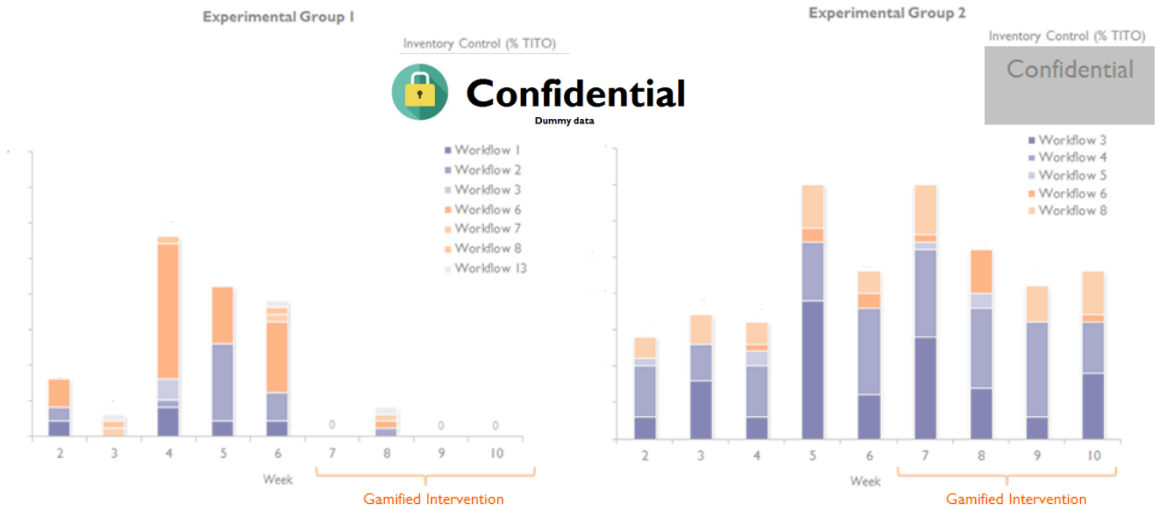


Figure 26 Inventory Control Performances Before and During the Second Gamified Intervention

Job Satisfaction

Next to the performances, the gamified intervention might have influenced the job satisfaction of the team members of the two self-managing teams. The job satisfaction is analyzed by the standardized questionnaire before and after the gamified intervention. The job satisfaction types are based on four key variables. The first variable scores their satisfaction regarding the desired and actual situation at work. The second key variable addresses the perceived level of control. The third variable addresses the goals and the demand of work next to the change of these goals and demands. Lastly, the fourth variable determines their perceived ability for solving the problems they are dealing with at work. Someone who is motivated balancing-oriented is scoring high on all four variables and therefore highly satisfied with his work. Someone who matches the job satisfaction type of classical resignation scores negative on all variables and therefore highly unsatisfied. The other types of job satisfaction are somewhere in between, having different high and low scores on these four key variables.

Table 177 **Job Satisfaction Before and After Gamified Intervention**

Experimental Group 1

Before Gamified Intervention	*After Gamified Intervention*
Employee 1	
Employee 2	
Employee 3	
Employee 4	
Employee 5	
Employee 6	
Employee 7	
Employee 8	

Experimental Group 2

Before Gamified Intervention	*After Gamified Intervention*
Employee 1	
Employee 2	
Employee 3	
Employee 4	
Employee 5	
Employee 6	
Employee 7	
Employee 8	

It is remarkable that most employees of both self-managing teams match the job satisfaction type of motivated-frustrated. The motivated-frustrated types are satisfied regarding three out of the four key variables and lack a perceived level of control. This is remarkable, as it concerns self-managing teams. If the perceived level of control can be enhanced, the motivated frustrated people will change to the motivated balancing-oriented job satisfaction type.

Furthermore, the analysis of these types shows that 4 out of 13 changed of type of job satisfaction after the gamified intervention, whereas 9 employees stayed even satisfied as they were on beforehand. It is interesting that 3 of these 4 employees did match the job satisfaction type of motivated balancing-oriented on beforehand, for which they are highly satisfied on all four key variables of job satisfaction. However, the movement to another type of satisfaction differs per employee per variable. Lastly, it is remarkable that 3 out of 4 employees who changed of their job satisfaction type are employees of the first experimental group.

Motivational Need Satisfaction

Next to the performances and job satisfaction, more insights are gathered by the motivational need satisfaction before and after the gamified intervention. Figure 46 shows the perceived levels of autonomy, competence and relatedness before and after the gamified intervention as analyzed by the standardized questionnaire for motivational needs satisfaction. For autonomy, 2 out of 8 employees of the first experimental group indicated an increase of their perceived autonomy of at least a 0,5 point on a 5 point Likert scale and of the second experimental group all self-managing team members indicated an increase in their perceived autonomy.



Figure 46 Differences in Motivational Needs Satisfaction Before and After Gamfiied Intervention

For competence, 7 out of 8 employees of the first experimental group felt more competent while the employees of the second experimental group indicate either a large increase or a large decrease in their perceived level of competence. This is remarkable, as these changes in their perceived level of competence are about 1 point on a 5 point Likert scale. A possible answer might be that the merger of two self-managing teams influenced the perceived level of competence of the second experimental group. For relatedness, both increased and decreased levels are shown in both self-managing teams although the differences are slightly bigger for the second experimental group which might also be explained by their new team composition.

Triangulating the Results

The quantitative results of the first two weeks are discussed with the self-managing teams and therewith triangulated with the qualitative findings of the focus groups, which are to be found in Appendix CA12. First of all, the self-managing teams indicated that the application provided them with insights in their performances in an easier way and the metaphor of profitability for the efficiency targets really enhanced their understanding of their efficiency performance. Regarding the quantitative results, the fluctuation of the total production hours is explained by self-managing teams as their on the daily inflow of customer requests. In line with their increased insights in performance and the dependency on the inflow of customer requests, the self-managing teams indicated that they learned that they could influence their performance by adapting their total working hours. Their reduced number of working hours per week is the result of downscaling of temporary workers and not caused by others of illness or other reasons for absenteeism. Therewith the design has solved one of the issues with the first gamification design, by which the self-managing team members only left pressure to increase their production.

Furthermore, from the evaluation session it is concluded that the first experimental group was more enthusiastic about working with the gamified application than the second experimental group, as they also had a better understanding of the key concepts of the gamified application due some learning from the first gamified intervention. Furthermore, the second experimental group mentioned that they were already performing quite well and in addition were really busy during the day as two teams were just before the gamified intervention were merged into a new self-managing team. Accordingly, they state that in general they spend less time and therewith where less actively involved with the gamified intervention than the first experimental group. The team manager underlines that the second experimental group was less actively involved whereas for the first experimental group really had a drive to win.

By focus groups with both experimental groups it is explained that self-managing teams do experience a feeling of relatedness with the application and therewith their 'own company'. Although the quantitative results do not show a change in perceived relatedness, both the team manager and the self-managing team themselves indicated that they communicated a lot more and experienced a better group ambience.

From this analysis is can be concluded that is it likely that the gamified intervention positively contributed to the perceived level of autonomy and competence, being aware of the fact that the second experimental group gained new workflows to be learned which could explain a lower feeling of competence for some employees. The gamified intervention did change the perceived levels of relatedness, however this change is to be seen in both positive and negative direction.

7.6.2 Evaluation of the Second Gamification Design

The second gamification design and the results of the gamified interventions are evaluated by three focus groups of all layers throughout the organization. The team managers questioned whether or not the gamification design was bought or developed for this research and were all really enthusiastic about the design and the potential usage at also their sub-division. They especially valued the coupling with the efficiency target as really relevant. The team managers had a target for December 2014 and are currently supporting their self-managing teams to achieve the target for April 2015, which is also used in the gamification design. As they already know their target for the end of 2015 they were enthusiastic about the possibility to continuously adapt the gamification design for continuous improvement.

Higher management was also really enthusiast about the gamified interventions and gamification design and are planning for one other pilot at another sub-division after this research to have enough quantitative data to substantiate the contribution of gamification to preferably the efficiency, but also possible to the customer satisfaction or employee satisfaction. Higher management recognized the technical limitations of the second gamification design which should be resolved before a widespread use in the organization.

The self-managing teams also evaluated the second gamification design very positively, whereas the experimental group 1 was more enthusiastic about the current use and the experimental group 2 came with a lot of suggestions for potential uses. The main use cases are concluded, as well as success factors that should be present to use a gamification design at ING Operational Services and the main ideas for further improvement.

Use cases
Based on the quantitative performances, the assumption was made that a gamified intervention was not suitable for new self-managing teams. However, the newly composed self-managing team indicated that they would perceive it useful for both new and experienced self-managing teams. For new teams the fun and stimulating way of working could enhance their performance, while experienced teams could really develop a strategy and by making use of all insights to enhance their performance.

The opinions regarding the involvement of the team manager are mixed. The first experimental group participated actively in the gamified intervention and also indicates that they would not give the team manager a bigger role. However, they also indicate that one of their team members was really motivated and accordingly motivated the rest of the team with her enthusiasm. The second experimental group was less actively involved and they indicate to make the team manager of more importance and to advice the team

It is concluded that the gamification design gives clear insights in the targets, the target activities, the bottlenecks and the progress with respect to the performances during the day. This is done in an easy and understandable way for which the aesthetics and visualizations are appealing. Both self-managing teams would recommend other self-managing team to start working with the gamification design as they argue that it mainly provided them with clear insights in their

Success factors
A first success factor is that the self-managing teams should have enough capacity and therewith time to start with the gamified intervention. The second experimental group indicated that they were really busy and therefore were not as much involved as they would have wanted to. The first experimental group added that a few months ago they also got four new team members within a short period of time. At that time they also needed all their time to handle the inflow of customer requests and all other tasks, even communicating properly was hard which on its turn also affected the ambience in the team.

A second success factor is that is should work from the start, otherwise the teams will lose their faith in its use. This finding was also confirmed by the gamification expert Niko Vegt (Vegt, 2015). The third success factor is to have appealing rewards, whereas even a small rewards or a symbolic award can be enough. Fourth, the gamification design should be easy to work with. Ideally, the self-managing teams should work with it all day all together in order to have a real time overview of the performances. Accurate data and therewith a real time overview of the performance is needed to steer for better performances.

Ideate Design Changes
An integration with existing data systems would be ideal, in order to limit the administrative tasks. In the current design the self-managing teams have to wait for the data synchronization, which is workable for such a small scale. However, ideally everybody should be able to access and change the data at any time. The self-managing teams also indicate that it would be easier if a minimalize function could be added, so they could leave

the application open all day. Another suggestion is to integrate the key progress bars with the desktop, so they are able to constantly check their progress.

Furthermore extensions could be made to the screens in the gamification design. A self-managing team member suggests to include the holiday schedules and days of leave. Another employee suggest to enable the self-managing teams to add other workflows and to change the norm and therewith the products and the prices of the products. This function is already developed but was left out of the gamification design in order to avoid the self-managing teams being overwhelmed with functionalities of the gamification design. For the norms, it should be avoided that too much time is spend on the discussion of norms. The norms represent average production times, for which the special cases of for example a really difficult customer request might cause a lot of discussion. Also for the workflows, a good balance should be found between the defined normalized production and a very long list of all possible customer requests. Although this idea is brought up, it was also stated at the current workflows and norms are in line with their key tasks and activities.

Other out of the box ideas are to integrate the gamified intervention with kata coaching, for which the self-managing teams each week conduct experiments in order to improve their performance. Their suggest to include bonus points for successful experiments. The same could be done for trainings, although they mention that the current way of expertise level is also nice.

7.6.3 The Possibilities for a Third Gamified Intervention

The gamification design process suggest to iterate with prototyping until the desired gamification outcome has been reached. Due to the time span of this research, two gamification design are tested with large improvements between them. As the second gamification design shows promising results for the contribution to the self-managing teams for ING Operational Services, is it useful to have some guidelines for the next steps. This paragraph will briefly explain the next steps for ING Operational Services and for any other organization that might want to use gamification for self-managing teams, see also Appendix A9.

The second gamification design shows promising results for both the quantitative performances in terms of efficiency and the qualitative performances as the understanding, improved communication, ambiance and ownership. The self-managing teams indicated in the focus group before the gamified intervention that they would not speak up to the manager if for instance a meeting on a particular day does not fit their planning. After the second gamified intervention, both team mentioned that they felt more ownership for their results and based on the clear insights are also able to notify the team manager when they have too much regulatory tasks on a day by which their performances are negatively influenced. As the kind of insights needed for this decision making are created by the gamification design, both teams prefer the continue working with it. Therefore, the first step has been to transfer the knowledge of the researcher to the team leader, so she is able to work with the self-managing teams independently with the gamification design.

A second step is to evaluate the design throughout the organization. This has also been done by the three focus groups. It is advised to take a closer look at the findings. As the results of the second gamification design should be interpret with care, due to several other influencing factors on the self-managing team performance, it may be useful to conduct another study by which this same design is applied at another team with another team manager. In order to do so however, it is important to start with the problem analysis in order to determine the complexities of the self-managing team and to see if gamification is a suitable mean to solve this. If this is the case, some choices should be made regarding the design. It is advised to let the teams think of their own company, as this increases the engagement. However, it should be determined if it is feasible to conduct these sessions and to adapt the design in the available time and for the available resources.

For a third study, it is not only advised to research another team and another team manager. It is also advised to use more self-managing teams, in order to conduct statistical analysis on the results. For the analysis, also influencing factors from the team composition can be included, to gain better insights in the performance. By

doing so, also an analysis can be done on the relation between the print thinking color and the ranking of the contribution of the motivational affordances per motivational need.

With the insights from the second gamified intervention or ideally with insights from additional research the organization can decide to invest in further development of the gamification design, to only make use of parts of the design or to do nothing with gamification but to look for other means that can contribute to the same complexities. If the organization would like to build upon the current gamification design, two important technical changes should be made. First, the system should be connected with Access instead of an Excel database to allow multiple users to use the gamification design at any time. However, a critical mark is that the application should be fast and easy to use, otherwise the self-managing teams will not use it for their own purpose but only because they have to. Ease of use is an important requirement, next to the connection with existing systems to minimize the administrative tasks.

If the organization does not want to invest making these technical adjustments, the organization can still make use of the findings of this research to enhance the performances. First of all, understandable performance indicators should be present for which the translation to revenues and profit turns out to really enhance the understanding. This could also be realized by well-designed dashboards. However, to increase the motivational needs satisfaction and to energize self-managing teams to take the actions that contribute to enhanced performances, motivational affordances should be added. However, these motivational affordances do not per se need to be design digitally and can also be implemented in another way. For instance a competition can be set up between two teams, to motivate them to enhance their performance.

Lastly, it is interesting to keep an eye on the performances of the two self-managing team that participated in this self-managing teams. The concluding recommendations for practical use are given in chapter 9.

8. Framework Design

The design of a framework synergizes the insights in motivational affordances, motivational needs, self-managing team performance and their intertwinement. The literature study of this research is used to identify the framework components, whereas their interrelations are researched by means of the case study. With the knowledge gained from both literature study and case study a framework is developed that can be used in the analysis and gamification design to enhance self-managing team performance.

First, the theoretical starting point for the framework development is explained. Second, the relevant components and their intertwinement as found in the case study are discussed. The theoretical insights complemented with the research findings are used to compose the framework for gamification to enhance self-managing team performance. The third paragraph will discuss the developed framework and its use for analysis and gamification design. Lastly, the evaluation of the framework is discussed.

8.1 Theoretical Starting Point for Framework Development

To develop a framework of gamification design for self-managing teams theory of organizational studies and game studies are used. From the organizational studies it is deducted how to distinguish between groups and teams and subsequently how to distinguish self-managing teams from other types of teams (Robbines & Judge, 2009). Accordingly a team effectiveness model is used to determine how the team outcomes are influenced (Cohen & Bailey, 1997). This model defines the direct influence of the team design by their task design, team composition and organizational context and secondly an indirect influence via the team processes, team norms and shared mental models. The self-managing team can be defined by the team demographics, maturity level, color print thinking or motivational triggers, the skillfulness and the perceptions of the self-managing team members in the self-managing team.

The focus of this research however is on the motivational need satisfaction of the self-managing teams. Organizations move to further decentralization and delegation of responsibilities and tasks to more people in the organization (Malone, 2004). An inspiring example is the machine company Semco, of which the CEO Ricardo Semler argues that people do not work to earn money but to feel good and to belong (Semler, 1993). He changed the organizational structure by removing two-third of the company's management and accordingly letting the rest of the staff determine everything themselves. Accordingly, the revenues increased from 30 million dollar in 1988 to 212 million dollar in 2003 (Semler, 2015). To design gamification in such a way that it contributes to self-managing team performance, the self-determination theory (Ryan & Deci, 2000a) is used as the theoretical starting point for motivational needs satisfaction. The self-determination theory brings forth a way to qualify motivation in terms of perceived autonomy, competence and relatedness which provides better insights of the possible contribution of the gamification design upon the user' motivation.

Another starting point are theoretical models of game design studies. The contribution of gamification to the motivational need satisfaction can be explained by the real world and the game world as defined by the model of Visch et al. (2013). The complexities and tasks among others of self-managing teams in the real world are used as the basis for the gamification design. In the gamification design users experience the game world and their learnings of the gameful experiences can be translated back to address the real world complexities. This model is complemented with the main identified motivational affordances of compete (Reeves & Read, 2009), challenge (Csikszentmihalyi, 1990), empathize (Schell, 2008) and explore (Malone, 1981); (Schell, 2008). Another motivating element typical for game design is fantasy (Visch, et al., 2013); (Malone, 1981), which in this research is considered as part of empathize in the game world.

Based on theoretical foundations of the organizational studies and game studies, the focus on self-managing teams, the motivational needs of autonomy, competence and relatedness, the motivational affordances of compete, challenge, empathize and explore and gamification design are considered as the key elements for the gamification design framework for self-managing teams.

Despite the beneficial effects of team-based working, teamwork also require increased communication, demands and conflicts to be managed (Bossche, 2006). Within a team, also individual concerns may play a role. Due to conflicting concerns of the individual employees within a team, the outcome of teamwork is almost never optimal and therefore it is important to enhance the collaboration between individual team members and to align the individual goals with the collective goals (Vegt, 2015) as illustrated by figure 47. Therefore it should be clearly distinguished when the framework will address the individual and when team performances.

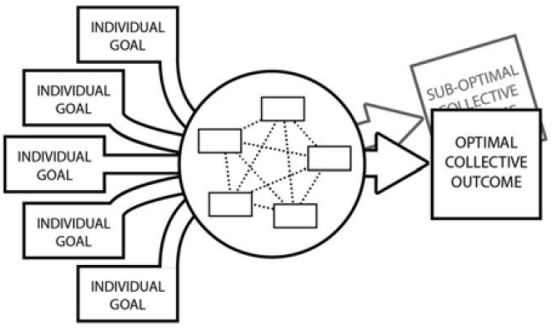


Figure 47 Structured Teamwork Situation for an Optimal Team Outcome (Vegt, et al., 2015)

8.2 Case Study Insights

To build upon the theoretical starting point for a theoretical framework development, the insights from the case study are used. In the first gamified intervention the contribution of gamification to self-managing team performances was positively valued mainly in a qualitative manner, as the quantitative analysis did not show any remarkable changes in performance. Accordingly the promising design changes are processed in a new gamification design for a second gamified intervention. The second gamified intervention showed promising results for the efficiency performance and more or less stable results for the quality of service, inventory control and job satisfaction of the two self-managing teams. To gain a better understanding of the contribution of gamification, the motivational needs and the contribution of motivational affordances to the motivational needs satisfaction are analyzed.

The perceived level of autonomy, competence and relatedness before and after the second gamified intervention is determined for 8 employees of the first experimental group and 7 out of 8 of the second experimental group. Figure 48 shows the change in motivational needs satisfaction for each motivational need. From these results it is concluded that the gamified intervention mainly contributed to the perceived level of autonomy and competence, as for relatedness an affect in both positive and negative directions are shown. It is remarkable that before and after the gamified intervention large changes are to be noted in the perceived level of competence for the second experimental group. However, this experimental group is composed out of two former self-managing teams, by which four new workflows and two new employees are added to a new self-managing team.

In addition to the satisfaction of the motivational needs, the contribution of the motivational affordances is ranked by the self-managing team members of both self-managing teams. Figure 48 illustrates that compete and challenge are ranked mostly for their contribution. The focus groups give a more thorough understanding of the contribution of the motivational affordances and the qualitative analysis highlights that compete and challenge mainly motivate the self-managing teams to achieve the target outcomes and to find out by the easy interface of key performance indicators and contributing activities how this can be achieved. Furthermore, it is argued by the focus groups that empathize and explore contribute to the understanding of target outcomes instead of just being motivated to achieve them. In the focus groups, the four specific motivational affordances are discussed more thoroughly. The motivational affordances and their evaluation for using them are as follows.

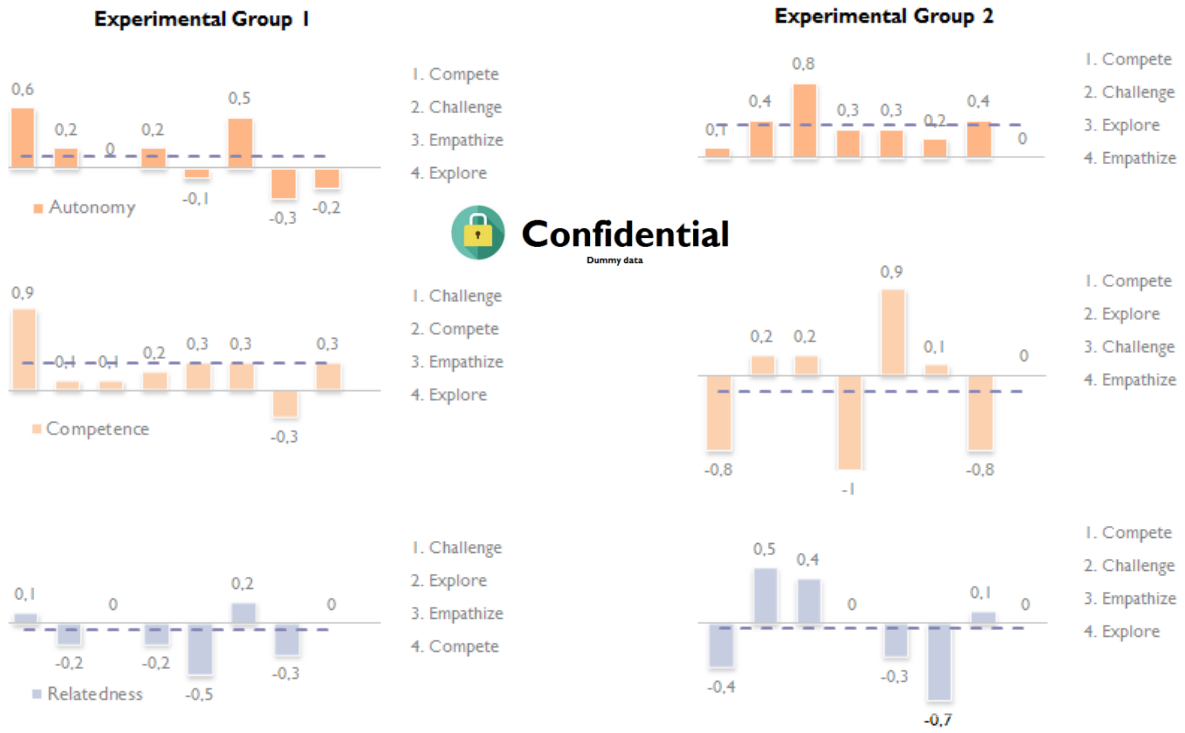


Figure 48 Motivation Need Satisfaction and the Contributing Motivational Affordances

Competition

For the competition, a lottery is used as the reward system. As the competition was designed for 10 days, 10 lots were in the running. The better the team performed, the higher their change was to win the lottery, for which the price were ten cards for the European Qualification Football match between the Netherlands and Turkey. By means of the lottery, both winners and losers stayed in the running to win the price.

After 10 days, 7 lots were achieved by the first experimental group and 5 by the second experimental group. However, both self-managing teams stated that they would not recommend to use a lottery again and argue that if it is a competition, the best should always win. They prefer to be rewarded for their efforts and not to involve luck in it. Therefore, they would like to have clear goals, for which it is clear when to achieve what. Accordingly the teams themselves could think of a strategy to achieve this, which could be their competitive advantage. However they also indicate that without the competition element, they would be more open to share their strategy to others.

Challenge

Each day the self-managing team achieved their efficiency target and also conducted quality controls and TITO inventory checks, the team won a lot. Although the lottery was designed to support the competition, it also functioned as a reward system for the challenge. This is why the focus is on motivational affordances, as it is already mentioned from a theoretical point of view that a game element can support multiple motivational affordances.

The self-managing teams mentioned that the reward system was not the main driver for their performance, as they recognized that the main benefits were their enhanced performances. However, one self-managing team member mentioned that despite the denial of all self-managing teams, she noticed that people conscious or unconscious do perform better if there is a reward involved. The employee mentions a use case of a colleague who processed a few extra customer request after 19h00, for which the inventory control target was reached to achieve the 100% score. All agreed that without the gamification design this colleague would not have picked up these extra requests. However it is debatable whether this extra effort is caused by the reward of by the progress bar.

In the gamification design progress bars are included for which the teams are challenged to reach a 100% score at the end of the day. The self-managing team mentions that they are telling each other from behind their computers what to do in order to reach their targets, whereas they did not communicate much at all before the gamified intervention. In addition, both teams also started with daily stand-up meetings and other short gatherings to discuss their progress and to define a strategy for the gamified intervention.

Empathize
The storyline and the metaphor of running your own business, support communication and a good ambience in the team. The team manager underlines that she clearly saw a better communication and cooperation within the first experimental team since December. The self-managing team members explained that they got to know each other a little better in mean time, but also stressed that the gamification design forces a self-managing team to communicate with each other in a good way. However they mention that the communication around downscaling might be hard at the beginning, but at a certain point in time once the team keeps making losses the team should start communicating about this. The team also experienced the benefits of it, as they have developed their own downscaling system during the gamified intervention initiated by themselves.

The team also mentioned that by the use of the metaphor, it feels like deciding for someone else. Therewith individuals objectives are mitigated, as in the case study for example the objectives of individual employee not to downscale, as this was directly reflected in their salary. The use of a metaphor is especially recommended at the start of a gamified intervention. After a few weeks, this could be translated back to the normal work situation. However, the fact that during the focus groups the self-managing teams were constantly talking about loses and profit instead of the corporate performance indicators, also indicates that this is a useful and understandable way to talk about performances.

Explore
To facilitate clear insights in the performance and to learn the self-managing teams a new skill, it is important that they are not overwhelmed with information. During the evaluation of the second gamified intervention it was already mentioned that the self-managing team members needed some time to learn how the application worked. However the self-managing teams also indicated that the unlocks could be linked to the maturity level of the self-managing teams.

8.3 Framework Gamification for Self-Managing Teams

The theoretical framework is developed from the findings from the literature study accomplished with findings from the case study. The framework could serve as a starting point for others to analyze and design gamification for self-managing teams or to build upon the insights with further research regarding the contribution of gamification for other types of teams.

The globe with a measurement tool on the left hand side represents the real world, in which for this study self-managing teams were the research objects. The self-managing team is visualized by its structure, as it is a group of people who share tasks and responsibilities regarding their performances. It is illustrated that their performances are measured by the stopwatch. To research the performance, one should also value the individual motivational need satisfaction.

Therewith the left hand side of the framework is the start for the system analysis. By analyzing the performance of a team in the real world, the team performances and the individual motivational needs should be studied. If the team shows potential for improvement and this is accompanying by a lack for a motivational need, the need and relevance for gamification can be justified.

To design gamification, elements from the real world are used in a game world. As the first gamification design of this research showed, just adding another interface does not motivate people to show other behavior. Therefore competence, challenge, empathize or explore could be added. It would be useful to have a better understanding of then to apply which motivational affordance. However to the small research group and the

widespread individual motivational triggers, characteristics and other factors that influenced their performance, no fixed relations are included in the framework, as illustrated in figure 49.

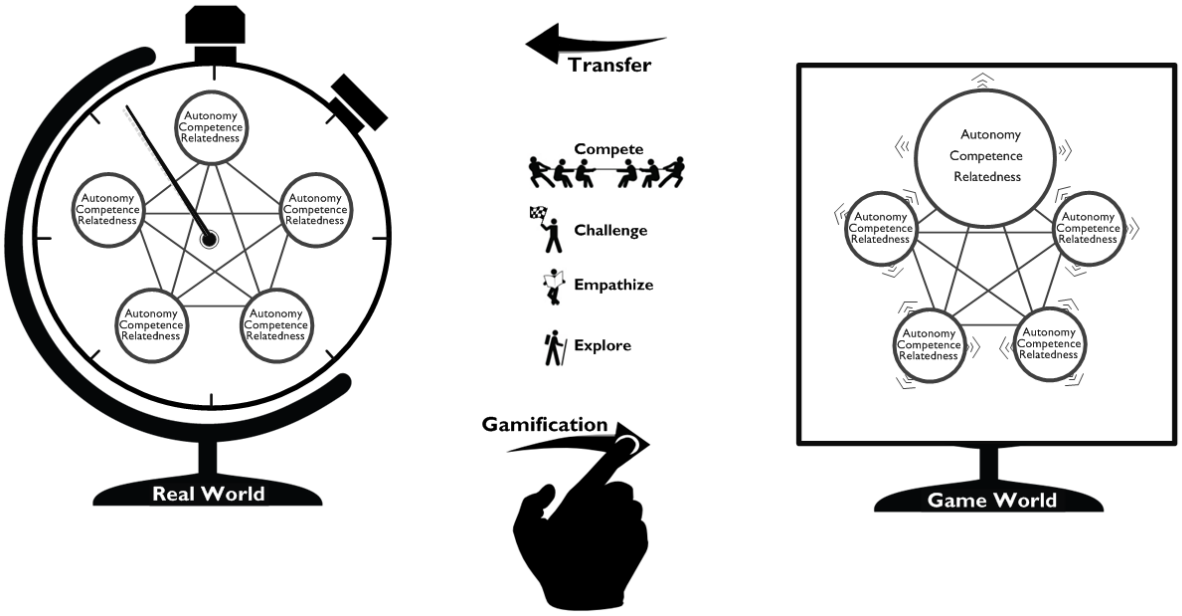


Figure 49 Final Framework for Gamification to Contribute to Self-Managing Team Performance

However the second gamified intervention did show that mainly the motivational affordances of compete and challenge contribute to the satisfaction of the motivational needs as they activate the user to action by creating a feeling of autonomy and competence. The motivational affordance of empathize contributes mainly to the transparency, understanding, communication and ambience whereas the designed exploration should be aligned with the maturity level and skills of the self-managing teams. For new composed self-managing teams less should be to explore than for more experienced teams. The motivational affordances mainly increase the perceived level of autonomy and competence. Due to a strong metaphor, the motivational need of relatedness is addressed. Therefore, the choice for a motivational affordance is dependent on both the individual and the team.

The satisfaction of the motivational need of one self-managing team member might already influence the team performance. For instance, in the second gamified intervention one self-managing team member was really motivated to win the competition and the other self-managing team members mentioned that she really motivated the others to perform better. To arrive at a useful game world, a gamification design process is to be followed. With respect to the design process of Deterding (2014a), it is advised to start with a system analysis and also embed the findings at the socio-technical system, as illustrated in Figure 50.

Both the theory and the case study findings substantiate that satisfying motivational needs in a game world could enhance the motivational needs in the real world, by which the performance are enhanced. A last crucial step for its use is the transfer from the game world to the real world, which could be done by a de-briefing.

The use of this framework is as a practical solution to determine if gamification is a suitable mean for the complexities at hand within an organization and accordingly to be used to determine the main concepts that need to be analyzed in order to choose a gamification strategy. Therewith the theoretical framework could be used for the analysis and first design steps, whereas for the gamification design more detailed design models can be used.

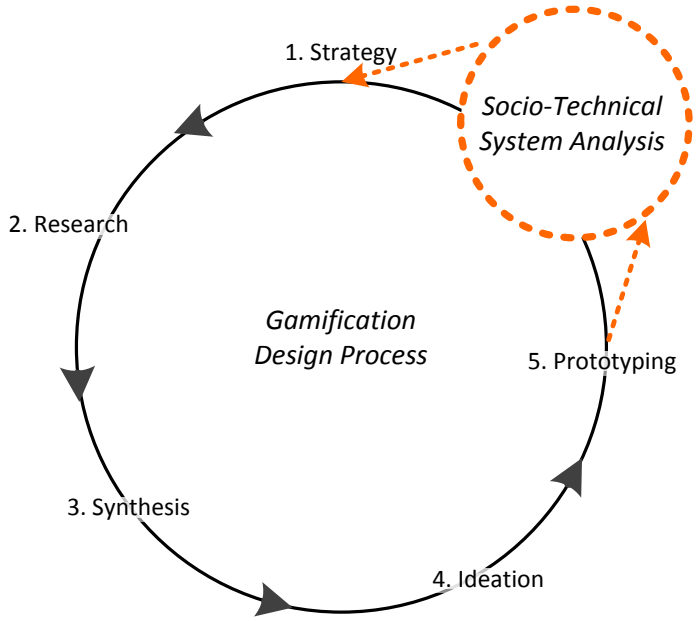


Figure 50 Additions to the Gamification Design Process

8.4 Evaluation of the Framework

The framework is evaluated by an expert session with Niko Vegt (Vegt, 2015). However for the evaluation a previous version of the framework is used. Although the current framework does include the same elements, it is important to note that the framework is not completely validated. Niko Vegt is an expert in gamification and is currently focusing his research on the motivational affordance relatedness. Therefore he underlines the use of motivational affordance to enhance the performances in the real world. However he questioned how the motivational affordances are defined. As also mentioned in this research, the four motivational affordances are the key motivational elements for this research. However, more research could show that there is a fifth motivational affordance of that not all identified four are of even importance.

Niko Vegt argued that the developed framework is a framework that could be put on top of his developed framework for competition or cooperation within teams. Therewith the states that it is logical that his research is conducted at the faculty of Technology, Policy and Management and he is located at Industrial Design. Therewith the use of the framework is also explained, as the framework can be used to translate the complexities in organizations to the need for a gamification design, whereas game design models could be used to further specify the design.

Lastly, Niko Vegt explained the use of relatedness in his research. We walked through both gamification designs, which showed quite a lot of similarities. The previous framework was more an overview of all researched concepts without synergizing them. Therefore, other remarks are or less relevance for the current framework.

9. Conclusions & Discussion

This final chapter of the report discusses and concludes the results of the research findings of a mixed methods research for which the results of quantitative and qualitative research are triangulated to support a better understanding of both theoretical and practical contributions of this research. The aim is to answer the central research question: *"Which motivational affordances of a gamification design contribute to motivational needs in order to enhance self-managing team performance?"*. After presenting the main findings, the relevant contribution to the scientific body of knowledge is presented. Societal contributions are presented by recommendations for ING Operational Services and the operational excellence consultants, as well as to organizations in general. Furthermore, the limitations of this study are discussed, followed by directions for future research. Finally, a brief personal reflection is provided on the research process.

9.1 Main Findings

The aim of this research is to provide insights in the contribution of motivational affordances to the motivational needs of self-managing teams in order to enhance their performance. The relevance or this research lies in the intertwinement of gamification as a mean for the complexities of self-managing teams in organization. Gamification is a broadly used term but also a poorly defined concept with still many unknowns regarding its definition, design and effects on motivation and performance. The use of self-managing teams in organizations is a way to anticipate to the need for flexibility and innovation to remain competitive. To move to decentralization and delegation of responsibilities and tasks, organizations are challenged to make their employees understand the organizational goals in order to interpret them and to decide upon this own actions to contribute. Despite the relevance of both trends for organizations and the promising fit for gamification as a mean to address these organizational challenges, it is unknown how gamification contributes to self-managing team performances.

This research makes use the design science research approach (Henver, 2007) to focus on the design cycle for a gamified intervention, while researching self-managing teams and making use of the knowledge base of theories and research methodologies. To arrive at the theoretical and practical research objective, five research questions are defined. The findings of the first research question provide an understanding of motivational affordances and how they are created by gamification. Gamification is considered as a system design practice of motivational affordances which takes into account the decision making processes of the people, the institutional systems and the technical systems of the organization. Motivational affordances are actionable properties that are created by game elements in a gamification design. This research has identified four relevant motivational affordances: compete, challenge, empathize and explore. Although game elements can support multiple motivational affordances, some game elements are more typical to a motivational affordance. Rules and leader boards are often used in a competition, whereas clear goals and actions are mostly part of a challenge. A narrative and interactive storytelling make a user empathize locked and unlocked elements and time pressure make the user curious to explore.

Second, the research fields of gamification and self-managing teams are combined to answer the second research question and arrive at the theoretical overview of the contributing motivational affordances to self-managing team performances. Gamification is designed to satisfy the humans' basic motivational needs of autonomy, competence and relatedness. Depending on the motivational needs satisfaction people are intrinsically or extrinsically motivated and it is found that an increase in motivation is related to increase of performance (Ryan & Deci, 2000a). This research focuses on the motivational need satisfaction and performances of self-managing teams. Self-managing teams are a special type of team who together take responsibilities from their managers and decide for themselves which activities contribute to the organizational goals. A self-managing team exists of individual team members and to arrive at an optimal team outcome, it is acknowledged that what may energize and activate one person may have the opposite effect on another. Therefore, this research continues with the four motivational affordances, although attention is paid to the design of competition as self-managing teams are steered on their team outcomes.

Third, a working gamification system is developed to research the contribution of gamification to self-managing team performances. Two gamification designs are developed and used in a case study at ING Operational Services. Therewith the third research question is addressed of how a gamified intervention might look like. Preceding the gamification design, the self-managing teams at ING Operational services are analyzed by means of observations, a survey, performance measurements and interviews. Accordingly the need and relevance of gamification as a mean for the complexities at hand is justified. The system analysis shows that self-managing teams at ING Operational Services are focused on handling all incoming customer requests the same day while focusing on a customer focused service. However the dilemma is that for providing this service, little attention is paid to the employed to achieve this service causing an efficiency potential of 80 to 500 fte for the department ING Operational Services. The gamification is designed a mean to support employees in their understanding of these goals, which they can interpret for themselves and which accordingly enables them to decide for their own self-managing team situations how they help the organization to get there. For the gamification design the design process by Deterding (2014c) is followed. By studying other examples, the idea to use a metaphor of running your own company is selected to base the gamification design upon. The gamification design is developed in the Microsoft Office Application Excel. The result is two gamification designs, for which the second gamification design is improved by the insights of a gamified intervention with the first gamification design.

Fourth, the results of two gamified intervention as studied to answer the fourth research question of in what way a gamified intervention contributes to self-managing team performances. The first gamification design is used in a two-weekly intervention in week 50 and 51 of 2014 with one experimental and one control team at ING Operational Services. Quantitative results are gathered by performance measurements which are triangulated with the qualitative results of a focus group. The main finding of the first gamification interventions was that the design positively contributed to the transparency of tasks and corporate performance measurements and to improved communication and ambience within in the participating self-managing team. However the gamified intervention did not contribute to the efficiency purposes as desired. The main learning's were to avoid mutual competition in the team and the need for a competition team, consequence for meeting and not meeting the challenge, an enhanced storyline and more discoveries of the unknown. These suggestions for improvement are taken into account for the development of a second gamification design, which was validated by the COO of ING Domestic Bank and the directors of department Operational Services and divisions Dagelijkse Bankzaken and Specials.

The second gamified intervention shows the potential for gamification to enhance the efficiency performances of self-managing teams. Two self-managing teams with different team characteristics are studied during a four week gamified intervention with the improved gamification design. After two weeks, the motivational needs and job satisfaction are measured. These quantitative results are complemented with the data from performance measurements and triangulated with qualitative results of three focus groups of self-managing teams, team managers and higher management. The results show improved efficiency performance for both self-managing teams, with the most increase in performance for the most actively and the experienced self-managing team. However the new composed team underlines the potential use of the gamification design for new teams. A success factor a gamified intervention for new teams however is a little over capacity to spend some time to start and learn about the use of the application. Another qualitative finding is that the design is also usable for more experienced teams and also for other self-managing team complexities next to a focus on efficiency. The gamification design contributes to the self-managing team performance by creating a better understanding in an easy and enjoyable way. Therewith the motivational affordances compete and challenge contribute to the perceived level of autonomy and competence. Qualitative findings indicate that the gamification design also contributes to the relatedness by enhancing the communication and ambience.

Fifth a theoretical framework is developed by synergizing the theoretical and case study insights for the relation between motivational affordances, motivational needs and self-managing team performance. Existing frameworks from game design studies and organizational studies are used as a theoretical starting point to which the triangulated insights regarding the contribution per motivational affordance is added. The theoretical

framework can be used for the analysis and design of gamification for the real world complexities of self-managing teams. To determine the need for a gamification in a real world, the performance and motivational needs of self-managing teams should be studied. Accordingly, motivational affordances can be created by gamification design, for which one's individual perceived level of autonomy, competence or relatedness can be enhanced. Depending on the team characteristics and the individual motivational trigger, there might be a preference for a particular motivational affordance. Lastly, the theoretical framework states that the enhanced motivational needs satisfaction of the individual is translated back to the real world by which the team performances are enhanced.

9.2 Concluding upon Theoretical Contribution

The theoretical research objective is to fill the void in theory regarding the contribution of gamification to self-managing team performances by analyzing the relation between motivational affordances and motivational needs and therewith answer the central research question. From a scientific point of view, there are many unknowns regarding the definition, design, implementation and outcomes of gamification. Using self-managing teams as research objects of gamification has not been studied much before. The theoretical contribution are the findings of an empirical study of the design and contribution of a gamified intervention for self-managing teams in order to enhance their effectiveness in terms of performance and job satisfaction.

The theoretical framework based on the findings from the literature study accomplished with findings from the case study, could serve as a starting point for others to analyze and design gamification for self-managing teams or to build upon the insights with further research regarding the contribution of gamification for other types of teams. The main findings of the relations between the motivational affordances created by gamification design and the motivational needs satisfaction are researched in order to enhance the performance are theoretical relevant. Mainly the motivational affordances of compete and challenge contribute to the satisfaction of the motivational needs as they activate the user to action by creating a feeling of autonomy and competence. The motivational affordance of empathize contributes mainly to the transparency, understanding, communication and ambience whereas the designed exploration should be aligned with the maturity level and skills of the self-managing teams. For new composed self-managing teams less should be to explore than for more experienced teams. The motivational affordances mainly increase the perceived level of autonomy and competence. Due to a strong metaphor, the motivational need of relatedness is addressed.

From the case study it is concluded that the use of a metaphor to create an entrepreneurial mindset is useful to address the challenges of self-managing teams. This is useful because there are many similarities between the challenges of an entrepreneur and a self-managing team. However it is concluded that to make the metaphor successful, all self-managing team members should be involved by the brainstorm about a company to run. From the case study it is concluded that the experimental group felt even proud about their company already after the first gamified intervention. Furthermore from theory it is concluded that job satisfaction is an important factor to the self-managing team performance, although the type of satisfaction did not change from their initial job satisfaction and the satisfaction after a gamified intervention. Mainly the most satisfied employee experienced a change in job satisfaction type, which is remarkable as their change is caused by a lower score on the perceived level of control.

A final theoretical contribution is the successful use of the design science research framework as a research approach and the gamification design method for the case study. The findings of both the research and the gamification design validate the use of both methods.

9.3 Concluding upon Societal Contribution

Considering the societal relevance, this research contributes to the quest of how to apply gamification in an organization and to gain insights in the contribution to the performances of self-managing teams. Prior to this research, there was little understanding on how gamification contributes to self-managing team performances.

The research provides an understanding in the relation between gamification and self-managing team performances based on the analysis of motivational affordances and motivational needs. These insights are not only very valuable for ING, also other organizations can benefit from these insights as more organizations more to a decentralized organizational structure. This research provides a practical solution to the complexities that organizations deal with. In order to foster gamification, the recommendations for the developed gamification design and the insights regarding gamification design for self-managing teams are discussed, as any contribution of gamification to team performances is of societal relevance.

Application for self-managing teams

This research provides a useful designed application to support self-managing teams in order to enhance their performances. The relevance of the application lies in providing the right insights for self-managing teams for their self-management by which they enhance their performances. All contributing activities and decision of the daily work of self-managing teams are captured by the application. The use of a metaphor makes the user look more objectively to their self-management and therewith it mitigates all kind of individual objectives that block the optimal team outcome. Simple performance indicators give a simple and good understanding of the goals and activities to contribute to these goals whereas the application also enhanced the communication within the team which is needed for good decision making. As the motivational affordances trigger the users to achieve the target outcome of the gamified intervention, the tool facilitates the insights needed to determine the how question.

Depending on the complexities that a self-managing team has to deal with, the application could be adapted. Also for a continuous changing organization, the content of the application is adaptable. For the short period of the gamified interventions, the teams were very enthusiastic about working with the application and recommended the use for both new teams as teams who have been working together for a longer time period. It is shown that the application support the perceived level of autonomy, competence and relatedness. However, it is important to evaluate the long term use of the application. Also the translation from the metaphor to the organizational goals is something to give enough attention to.

For ING it is important to be aware of the technical limitations of the current application. The developed application is a proof of concept. To further develop the tool it is advised to first execute another case study for which most material of this research can be used. As the performances of self-managing teams are influenced by many other factors and also by the team manager, it is advised to set up a case study at another division with more self-managing teams. However for selection of the self-managing team attention should be paid to their complexities at hand and to determine if gamification would be the optimal mean to address the complexities. With the insights of a second case study it can be evaluated what the gamification design should include. It should be noted that the gamification design should be a simplified reality and therefore only the key complexities should be included. This could all be executed within a few months, after which it can be decided to invest in the technical development and integration with existing systems of the organization. These steps for implementation might also be applicable for other organizations than ING.

Other use of gamification for self-managing teams

The gamification design of this research is not the only way to use gamification for self-managing teams. Therefore, organizations can also the developed framework as a starting point for analysis and design of an existing gamification design. It can also be used to develop a new gamified design. This research shows the usefulness of the gamification design method of Deterding (2014a) and the development software Microsoft Office application Excel. Many enterprises have a Microsoft Office license, which limits the investments to be made. In order to use the Excel application for a gamification application on a larger scale throughout the organization, the database should be coupled with Access. As Excel offers more room for creativity and therewith possibilities to create a gameful experience, the supporting infrastructure could be a Excel application with a data link to the Access Database. Depending on the expertise of the designer, also other support infrastructures can be explored like an online application with for instance a SQL database.

Instead of developing a digital tool, it might even be possible to integrate a challenge or a competition with a non-digital design. In order to do, it is advised to take into account the technical systems, institutional arrangements and the decision making processes in order to really integrate the gamification as a mean to optimize the systems performance.

9.4 Limitations

To value the contribution of this research, it is important to value the findings and contributions in the light of its limitations. In order to do so, the generalizability, methodological and theoretical limitations are addressed.

Generalizability
To generalize the results and findings of this research, three limitations are identified. First of all, it has to be noted that the number of participants was relatively small and not randomly chosen. Due to the availability and willingness, two self-managing teams are appointed as research objects. Without randomization and with 16 participants, the possibilities for statistical data-analysis are limited. Furthermore, as the teams are not completely comparable in terms of tasks, composition, targets and performance a pre-experimental set-up is chosen although an experimental group with a control group would have been preferred.

Secondly, the study is conducted at two self-managing teams whereas the maturity level, group composition and tasks may be of influence on their performance. In addition, although the teams are called self-managing teams, the degree of self-management may be a point of discussion. With the small sample size, the effect of these factors cannot be concluded. Thirdly, the self-managing teams are both from a financial organization. The organizational context may be of influence on the contribution of gamification to self-managing team performance.

Methodological
Although the use of mixed method research is valued as really useful as the findings of both quantitative and qualitative research are checked and enriched, also four methodological limitations have been identified for this research. With respect to the methodology, the large numbers of several methods might also be seen as a limitation as the large number of methods limited the depth of analysis to a certain extent.

First, in this research an exploratory and explanatory study is conducted. Due to the extensive problem analysis and two design cycles, the time period for the two gamified interventions were relatively short. It would have been interesting to expand the time period and to have a more extensive evaluation of the performances after the intervention period. Furthermore, a longer time period would allow for more so-called investments in the gamification application, as for this intervention only a limited set was included in order to avoid the participants being overwhelmed with options.

The investments represent the topic in which a self-managing team can invest. It would have been interesting to have left the investments open so that they could be filled in by the self-managing teams. In this way a team can also discuss the team specific investments that are needed. Furthermore, for a continuous changing organization, these open investments could be adapted to the needed investments for a self-managing team. For instance, if the group composition changes due to changes in the organization, a self-managing team might want to invest in team building activities.

A second methodological limitation is the balance between the four motivational affordances in the gamification design. To research the contribution of each motivational affordance, the user should have perceived each motivational affordance. In addition, the user may have a preference for a motivational affordance and therefore values its contribution to a higher extent.

A third limitation might be the use of the application. The application provides many insights in the functioning of the self-managing teams. However, it is very important to stress that the use of this application should only be supportive for self-managing teams and not to control them. By using the application is such a way, self-

managing teams are likely to immediately lose their trust in the application and are likely to show strategic behavior while filling in the data.

Fourth, the tool has been specifically designed for two self-managing teams, but by changes in the teams' the design had to be renewed and therefore had to become more generic. This delayed the experiment as the design was very time consuming, but it was very beneficial for the development of the application because processes and teams continuously change over time. This does raise the question how specific or generic the application should be designed in order to optimally enhance the self-managing team performances and being usable for all types of self-managing teams within the organization.

Theoretical
Four theoretical limitations are identified. First of all, there are a lot of parallel and overleaping terms for the use of game elements for serious purposes, next to Gamification. Due to these widespread definitions, it might be the case that others have published relevant research that was not found due to the specific key words used in an online search database. Furthermore, a lot of interesting statements are to be found on blogs and other sources on the internet while the scientific available insights is for a large part a big spaghetti of vague concepts and non-comparable studies.

Secondly, the effectiveness of self-managing teams is researched in terms of performances and job satisfaction. However, a more satisfied employee might also perform better and better performances may satisfy the employee. This relation is not researched extensively, due to the focus of this research on the relation between motivational affordances and motivational needs.

A third limitation is the situational dependency for the suitability of motivational affordances. Not every organization and system allows for all four motivational affordances. For instance, a competition may not be appropriate or the activities may be very abstract that it is hard to empathize.

Fourth, gamification touches upon the ethical discussion, whether using game elements to 'make people' perform the desired behavior is ethical. In my opinion, if you do not pursue people and make them aware of the boundary between gameplay and reality, it is ethical to try to find the drivers for peoples' motivation. However, this should be treated with care.

9.5 Future Research

The findings and limitations suggest some interesting directions for future research for the contribution of gamification to self-managing team performances. In a continuously changing organization with many changes of people and workflows in self-managing teams, the kind of effects that you want to achieve with the application become even more important. As there are always new people joining the self-managing teams, the professionalization & motivation among other elements can be affected, which again highlights the need for such a gamified application.

First of all, it would be interesting to conduct the explanatory study with a greater sample size for an improved statistical power and generalizability of the findings. It would suggest taking a sample size of at least 30 participants. In addition, it would be interesting to set up an experimental design with control groups. Second, it would be research also other factors that might have influence on the performance of self-managing teams. A more extensive study of the team composition and tasks could strengthen the findings. In addition, a third direction would be to research the contribution to other types of teams. Therewith the effect of self-managing team characteristics could be determined and the framework could be generalized for teams in general than self-managing teams. Also the influence of the organizational context could be researched, as a fourth direction for future research, in order to evaluate the influence of cultural and institutional aspects. A fifth direction for future research is to focus on the role of the team manager, instead of the self-managing teams. The team manager has a supportive role towards the self-managing team performance; however the team manager does

influence the effectiveness. As a team manager is confronted with targets, the supportive role might be conflicting with the tendency to command and control the achievement of the set targets. As gamification is a trending topic for researchers and the industry, it is expected that more knowledge will be developed in a relatively short term. Therefore, future research should use the new achieved insights by other researched in order to optimize the use of gamification for self-managing team effectiveness.

9.6 Personal Reflection on Research Process

This thesis is concluded with my personal reflection on the research process. I will reflect on the development of the knowledge base, the case study and the interpretation of the findings.

Knowledge Base
For the knowledge base I studied literature of mainly three fields, gamification, motivational needs and self-managing teams. To study gamification, I chose to focus on motivational affordances. This choice determined the way gamification is designed and researched in this research. Although I certainly believe it is useful to focus on motivational affordances, I is also hard to justify that this is the only correct way to look at gamification. By focusing on motivational affordances, my research was more or less directed to the behavioral science field. As the behavioral science field was relatively new fields to study for me, a lot of effort was put in acquiring sufficient relevant knowledge about the performances or self-managing teams and how this relates to the motivational need satisfaction. Another point of view could have been to focus on the mechanics, dynamics and aesthetics of gamification by which my research probably would have been directed more to the game design field.

Looking back at the relevance of this research, I do think it is more useful to focus on the behavioral aspects as these are key to the way self-managing teams take decisions that influence their performance. Especially when looking at ING Operational Services, the self-managing teams are handed many tools and methods for improvement but really a way should be found to support them to use these tools and methods, to ask for insights and to have a drive to enhance their own performances. Due to the limited time scope of this research, the choice was made to put more focus on gamification than on self-managing teams. This choice is made as a wealth of information is available on self-managing teams, however in practice this does not always work out as intended. Regarding my academic background and experience with (serious) game design, it seemed more logical to analyze the main challenges of self-managing teams and accordingly design a solution for it, than go more in depth regarding the functioning of self-managing teams and all factors that influence their performance.

Case study at ING Operational Services
For my research, I really enjoyed conducting a case study in a real-life context although I also experienced some luck and difficulties while doing so. First of all, I was quite certain about the research topic gamification. With that idea in mind, effort was put by me and ING Blackbelts to study the suitability for gamification at five project. That was a really good start, as luckily we identified early in the process that data gathering and testing was way easier while applying a gamified intervention internally (with employees) instead of externally (with customers). As early in the process several bottlenecks were known in the performance of self-managing teams, this was a good starting point to research if gamification would be a suitable mean for self-managing teams. I really liked working with people and to see if I can use theoretical promising methods to enhance their performance or job satisfaction. A little drawback was that the self-managing teams were located in Leeuwarden, which asks quite some effort and travelling time to spend enough time for the analysis, design, intervention and evaluation phases.

First of all I encountered a wide variety of technical problems, for which I had to find out smart solutions in order to overcome them. Looking back, I put too much time and effort in the challenge to link the system with existing databases and secondly, to make the application accessible by multiple people all the time. For the design, I learned a total new programming language was learned which was quite challenging and fun, however

developing an application without any pre-knowledge about the programming language, is also quite time consuming. It creates a lot of surprises like finding out some very handy tricks just a day before the final prototype is launching.

I should have accepted earlier in the process that it is all-right if people have to administrate their processed customer request both in the gamification application during the day and in the corporate administration tools at the end of the second, as this only takes a few minutes a day. Secondly, I also should have accepted earlier that I am not a programmer and it takes too much effort for me to synchronize all data at every minute without having notifications pop up that you have to until the synchronization is completed. As I was totally inexperienced with vba programming, sometimes the smart and easy solution only was found out after too many trail and errors. In terms of personal development, I do am proud of my new programming skills.

Next to the technical complexities, I encountered some organizational challenges. How much I liked working with self-managing teams, I also experienced the downside of working with people in a continuously changing organization. After the first intervention I put lots of effort in a design for the second gamified intervention. Just before we were ready to launch the second intervention, some changes occurred at the sub-division. Among other changes, two self-managing teams were merged into one team and therefore new members and new workflows had to be added to the application. This was a key learning point for the development of the application. The more specific you make the application on people and teams, the harder it is to deal with the changing organization. Although this caused some delay in the research process, it also forced some major beneficial changes for the design. As the design was made relatively specific for four self-managing teams, this event led to a design iteration in order to make it more general and therewith applicable for any self-managing team. Instead of programming for the specific workflows, production norms and employees input fields were created in which these inputs can be easily changed. A lesson learned is that earlier in the design process, the design requirement of the suitability for a continuously changing organization should have been taken into account as these changes are rather rule than exception.

Finally, I experienced a very positive vibe around gamification, as I was very much welcomed with my ideas about gamification at several departments of ING. As next to 'Dagelijkse Bankzaken' also 'Post@ING', 'OS Beleggen' and 'HR Operations' asked me to provide them with more insights of what I was researching. Also even before my explanatory study was finished, I was asked to present my research at a meeting of the COO of ING Domestic Bank, the director of 'Operational Services' and the directors of 'Dagelijkse Bankzaken' and 'Specials' and I also presented it to the visiting French bank BNP Paribas. Although these sessions were really fun and interesting for validation and evaluation of the design, it is also challenging to keep them aware of the fact that the results are jet to come and first the contribution should be determined.

Interpretation of Main Findings

This research provides a useful understanding in the contribution of gamification to self-managing teams. However, the results have to be interpreted with care. For the standardized questionnaires, these are certainly advised due to their validation of use. However, I experience some difficulties to explain certain concepts or terminology to the members of self-managing teams. I tested the motivational need and job satisfaction questionnaire with some friends, by which I already encountered some concepts that require a bit more explanation in order to fill the questionnaires in correctly. As the educational level of the self-managing team member might even differ more than the differences between me and my friends, it is not completely certain that the respondents always understood the questions right.

Lastly, I would like to promote the use of a mixed method research by which the findings of a quantitative and qualitative research method can be triangulated. Using this for the problem analysis and both design cycles of my research, I gained a better understanding of the contribution of gamification to self-managing teams than I think I can ever put on paper by just explaining the analysis and the findings. However a less extensive use of methods would have enabled the researcher to interpret the main findings more thoroughly.

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Public Appendices

Part 1 Self-Managing Team Analysis

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A1. Developed Survey for the Problem Analysis

To enlarge the insights about the self-managing team functioning, a survey is developed to conduct during the problem analysis of the case study. This appendix discusses the survey that is developed for the problem analysis of self-managing teams at ING Operational Services. A second part of this appendix covers the results and is to be found in the Confidential Appendix CA5.

The survey is developed by making use of the theory of important factors for team effectiveness as presented in chapter 2. The team effectiveness model (Cohen & Bailey, 1997) presents the team composition, task design and organizational context as important factors.

To analyze the team composition, the color print thinking test is included in the first part of the survey. The color print thinking theory stresses that members of a team may have perspectives to either create a change on an individual level, to enhance performances on team level or to strive for better organizational results on the organizational level (Caluwé, 2012). By using the color printing test, a simple classification can be made of the different motivational triggers of each employee in a self-managing team individually and on a team basis which may be helpful to describe the team composition.

In addition to the color print thinking, the demographics are questioned to gain a good overview of the team position. Next to the color print thinking, the gender, age, nationality of each self-managing team member is asked. Koivisto and Hamari (2014) argue that there are demographic differences in the perceived benefits of gamification, whereas women are likely to experience greater benefits and the ease of use is likely to decline with age.

To gain insight in the task design, the workflows questioned in the questionnaire. The respondents are asked to fill in their skillfulness per workflow to analyze who is able to perform which self-managing team activities. For each workflow and the main regulatory tasks as to give training, to control the quality of workflows and to support management, employees have to indicate to which extent they are able to handle the workflows and regulatory tasks individually. To gain more insight in the task design, also questions regarding the type of contract, the desired number of working hours and the time employed within the organization and within the self-managing team are included.

Furthermore, the survey gathers data about the perceived level of autonomy, competence and relatedness in general, as the self-determination theory (Ryan & Deci, 2000b) argues that by fulfilling the motivational needs people can be stimulated to show behaviour that influences performances positively (Ryan & Deci, 2000a). These questions are complemented with questions about the employees' motivation and enjoyment at work, as this is often addressed by gamification (Hamari, et al., 2014). Therefore several statements are developed and rated in the form of a fifth-point Likert-type scale.

Lastly, the personal objectives and the knowledge about higher management objectives are included as it is argued that the organization goals should be transparent to the users and that in order to motivate the user the gamification should be developed by a user-centered design instead of an organization-centered design (Nicholson, 2012). These questions are complemented with questions addressing the insights in the team performances. The final developed survey is presented next.

A1.1 Survey Experimental Group

EvaSys	Master Thesis Project Aniek Berendsen - *Survey Team Cards Beheer*	Electric Paper

TUDelft

Mark as shown: ☐ ☒ ☐ ☐ ☐ Please use a ball-point pen or a thin felt tip. This form will be processed automatically.
Correction: ☐ ■ ☐ ☒ ☐ Please follow the examples shown on the left hand side to help optimize the reading results.

1. Research on Gamification

Dear ING employee,

I'm Aniek and I'm a graduate intern at ING Blackbelts. For my graduation at the Delft University of Technology, I'm conducting a research into the use of gamification. Therefore, I would like to ask you to fill out this survey as the information is very valuable for my research.

First of all, it is important to know that this survey will be processed anonymously (through the bar code at the bottom of the page). Only the aggregate scores will be studied, which will not lead back to you as an individual. Additionally, this survey will solely be used for research, meaning that without your permission in advance the retrieved data and results will not circulate within ING.

The survey consist of three parts and will take approximately 15 minutes.

1. The first part is a so-called colour test, which can tell you something about your personality, to a certain extent. The research will only use the results of the group composition. Please approach me if you would like to retrieve your individual scores.

2. The second part concerns a skills matrix. The data will be used to generate an overview of the skills present in the team with respect to the different workflows. In addition, an overview is made of the desired training in these skills.

3. The third part covers some personal questions. I would like to ask you to answer these questions as honest as possible, please know that the answers will not be shared within ING. The data will only be used to deploy Gamification optimally and to determine the outcomes of gamification within this team.

Thank you in advance!

Aniek Berendsen

2. *Part 1 - Change of people and organizations*

The first part covers 12 questions regarding the change of people and organizations. Please divide 8 points over the five statements of each item.
These points can be distributed over a few statements, for example **A=2**, **B=3**, C=0, D=0, **E=3**
The points can also be allocated to one statement, for example A=0, **B=8**, C=0, D=0, E=0

3. In my opinion, a change can only be successful if:

3.1	The key managers support it	Totally disagree	☐	☐	☐	☐	☐	Totally agree
3.2	The key persons are motivated for it	Totally disagree	☐	☐	☐	☐	☐	Totally agree
3.3	Clear objectives have been set in advance	Totally disagree	☐	☐	☐	☐	☐	Totally agree
3.4	People gain new insights	Totally disagree	☐	☐	☐	☐	☐	Totally agree
3.5	The strength and energy of people are addressed	Totally disagree	☐	☐	☐	☐	☐	Totally agree

4. In my opinion, it is important that in a process of change:								
4.1	Alternation takes place between goals and reflection	Totally disagree	☐	☐	☐	☐	☐	Totally agree
4.2	A good atmosphere is build	Totally disagree	☐	☐	☐	☐	☐	Totally agree
4.3	People's own meanings and perspectives are taken into account	Totally disagree	☐	☐	☐	☐	☐	Totally agree
4.4	Negotiation takes place about resources and outcomes	Totally disagree	☐	☐	☐	☐	☐	Totally agree
4.5	Milestones are set and the process is steered	Totally disagree	☐	☐	☐	☐	☐	Totally agree
5. In my opinion, a person who realizes change should:								
5.1	Provide room for initiative and ownership	Totally disagree	☐	☐	☐	☐	☐	Totally agree
5.2	Provide a managed development of the process	Totally disagree	☐	☐	☐	☐	☐	Totally agree
5.3	Treat people with care	Totally disagree	☐	☐	☐	☐	☐	Totally agree
5.4	Empathize on how people learn	Totally disagree	☐	☐	☐	☐	☐	Totally agree
5.5	Ensure consistency between managers	Totally disagree	☐	☐	☐	☐	☐	Totally agree
6. In my opinion, the following is indispensable in a change:								
6.1	To know clearly what should be achieved	Totally disagree	☐	☐	☐	☐	☐	Totally agree
6.2	To create room for movement by removing blockages	Totally disagree	☐	☐	☐	☐	☐	Totally agree
6.3	To have a reasonable time pressure to take decisive actions	Totally disagree	☐	☐	☐	☐	☐	Totally agree
6.4	To exchange experiences and knowledge in a group	Totally disagree	☐	☐	☐	☐	☐	Totally agree
6.5	To sketch an attractive prospect for people	Totally disagree	☐	☐	☐	☐	☐	Totally agree
7. In my opinion, organizations change if:								
7.1	People feel that they are heard	Totally disagree	☐	☐	☐	☐	☐	Totally agree
7.2	There is room for reflection and feedback	Totally disagree	☐	☐	☐	☐	☐	Totally agree
7.3	People go in dialogue together	Totally disagree	☐	☐	☐	☐	☐	Totally agree
7.4	People know their target	Totally disagree	☐	☐	☐	☐	☐	Totally agree
7.5	The strategy changes first	Totally disagree	☐	☐	☐	☐	☐	Totally agree
8. In my opinion, a change should:								
8.1	Ensure that people listen and learn from each other	Totally disagree	☐	☐	☐	☐	☐	Totally agree
8.2	Be able to untangle underlying patterns	Totally disagree	☐	☐	☐	☐	☐	Totally agree
8.3	Ensure that all activities contribute to the result	Totally disagree	☐	☐	☐	☐	☐	Totally agree
8.4	Gain insight in positions and interests, and act from there	Totally disagree	☐	☐	☐	☐	☐	Totally agree
8.5	Offer people opportunities for development	Totally disagree	☐	☐	☐	☐	☐	Totally agree



9. In my opinion, a change is only possible if:							
9.1	People see the overarching goal	Totally disagree	☐	☐	☐	☐	☐ Totally agree
9.2	People form coalitions	Totally disagree	☐	☐	☐	☐	☐ Totally agree
9.3	People are motivated and rewarded	Totally disagree	☐	☐	☐	☐	☐ Totally agree
9.4	People are taking initiative themselves to act	Totally disagree	☐	☐	☐	☐	☐ Totally agree
9.5	People understand how they can change themselves	Totally disagree	☐	☐	☐	☐	☐ Totally agree
10. In my opinion, the essence of change is:							
10.1	To create a new balance of power	Totally disagree	☐	☐	☐	☐	☐ Totally agree
10.2	To develop a dynamic process	Totally disagree	☐	☐	☐	☐	☐ Totally agree
10.3	To learn from each other	Totally disagree	☐	☐	☐	☐	☐ Totally agree
10.4	To approach people respectfully	Totally disagree	☐	☐	☐	☐	☐ Totally agree
10.5	To steer activities and people	Totally disagree	☐	☐	☐	☐	☐ Totally agree
11. In my opinion, it is important for the success of a change:							
11.1	To recognize opportunities and chances	Totally disagree	☐	☐	☐	☐	☐ Totally agree
11.2	To organize support	Totally disagree	☐	☐	☐	☐	☐ Totally agree
11.3	To create solidarity	Totally disagree	☐	☐	☐	☐	☐ Totally agree
11.4	To think first, then act	Totally disagree	☐	☐	☐	☐	☐ Totally agree
11.5	To be open with each other	Totally disagree	☐	☐	☐	☐	☐ Totally agree
12. In my opinion, the following is important to realize change:							
12.1	Good mutual agreements, made in advance	Totally disagree	☐	☐	☐	☐	☐ Totally agree
12.2	A safe learning environment being present	Totally disagree	☐	☐	☐	☐	☐ Totally agree
12.3	Room for self-management	Totally disagree	☐	☐	☐	☐	☐ Totally agree
12.4	Two-way communication between people	Totally disagree	☐	☐	☐	☐	☐ Totally agree
12.5	One possible solution that leads to the desired result	Totally disagree	☐	☐	☐	☐	☐ Totally agree
13. In my opinion, people change if they:							
13.1	Feel good about it	Totally disagree	☐	☐	☐	☐	☐ Totally agree
13.2	Have clear goals	Totally disagree	☐	☐	☐	☐	☐ Totally agree
13.3	Are better off themselves	Totally disagree	☐	☐	☐	☐	☐ Totally agree
13.4	Understand its meaning	Totally disagree	☐	☐	☐	☐	☐ Totally agree
13.5	Could learn from it	Totally disagree	☐	☐	☐	☐	☐ Totally agree



14. In my opinion, the following say expresses the best how to change:

14.1	A honest man keeps his word	Totally disagree	☐	☐	☐	☐	☐ Totally agree
14.2	You should be well prepared	Totally disagree	☐	☐	☐	☐	☐ Totally agree
14.3	By doing something one learns how to do it	Totally disagree	☐	☐	☐	☐	☐ Totally agree
14.4	Many small things together can lead to something big	Totally disagree	☐	☐	☐	☐	☐ Totally agree
14.5	If you are nice to others, they will also be nice to you	Totally disagree	☐	☐	☐	☐	☐ Totally agree

15. *Part 2 - Workflows at Team Cards Beheer*

Within your team there are different workflows and activities. The number of processed requests or the time spent on certain activities are registered in the program Promise IV.

I would like you to know if you are trained for and if are able to complete a workflow. Please choose for each workflow the statement that applies to you.

1. **Yes, I can handle this workflow** (Yes)
2. **No, I'm not educated enough to execute the operations necessary for this workflow** (No,I'm not trained)
3. **No, I'm not educated enough but I would like to be trained for this workflow** (No, I want training)
4. **No, this workflow is not applicable for me** (NA)



[redacted]

16. Competence

16.1	The competences of me and my team are sufficiently for our workflows:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
16.2	The flexibility of me and my team is good:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
16.3	The adaptability of me and my team is good:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
16.4	Within my team we communicate well:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
16.5	My team communicates well with our team manager:	Totally disagree	☐	☐	☐	☐	☐ Totally agree

17. Autonomy

17.1	Within my team we consider ourselves as autonomous:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
17.2	Within my team we feel ourselves responsible for our team performance:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
17.3	The collaboration within my team is good:	Totally disagree	☐	☐	☐	☐	☐ Totally agree
17.4	The collaboration between my team and the team manager is good:	Totally disagree	☐	☐	☐	☐	☐ Totally agree

[redacted]

18. Relatedness

18.1 The ambience in my team is good: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

18.2 The team spirit in my team is good: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

18.3 My working environment encourages me to perform well: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

18.4 My personal goals in my work are as follows:

18.5 I work at ING for the following reasons:

18.6 I believe I can achieve my personal goals at ING: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

18.7 The objectives of higher management (Fred Tuininga & Ellie Jagter-Delfstra) that affect my team are clear to me: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

18.8 My personal goals are in line with the goals of higher management: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

18.9 The objectives of higher management (Fred Tuininga & Ellie Jagter-Delfstra) that affect my team are as follows:

19. Enjoyment & Motivation

19.1 I enjoy my work: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

19.2 My team enjoys our work: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

19.3 In general, I'm satisfied as an employee: Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

19.4 I would value my motivation for our work as follows: (Please give a grade between 1-5 and please also check a decimal in the second row of numbers)

19.5 I would value the motivation of my team for our work as follows: (Please give a grade between 1-5 and please also check a decimal in the second row of numbers)

19.6 My motivation for my work is primarily:

☐ A-motivation: *"I'm actually not really motivated"*

☐ Extrinsic motivation: *"I work to earn my salary"*

☐ Intrinsic motivation: *"I work because I like the job and because I want to develop myself"*

☐ Otherwise, namely ...

20. Productivity, Effectivity & Efficiency

20. Productivity, Effectivity & Efficiency [Continue]

The working hours are registered in Promise IV in the following categories:

1) *Defined production*
For example change package, end spread payments, end credit card and new pin request

2) *Undefined production*
Other tasks that are labeled in Promise IV as other production

3) *Remaining hours*
Hours spent on quality, management support, training, consulting, project and systems failure

20.1 De productivity of my team is good: *(Our amount of "defined production" according to the defined norm is good)* — Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

20.2 The efficiency of my team is good: *(Our amount of "defined production" with respect to our total number of working hours is good)* — Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

20.3 The effectivity of my team is good: *(What we do, we do well)* — Totally disagree ☐ ☐ ☐ ☐ ☐ Totally agree

20.4 The amount of hours our team works per day depends on:

20.5 The major bottlenecks in the work of our team are:

20.6 We could be more productive if:

20.7 With respect to my team, I'm proud of:

20.8 With respect to my team, I would like to improve the following:

21. Demographics

21.1 Gender: ☐ Male ☐ Female

21.2 Nationality: ☐ Dutch ☐ Other, namely ...

21.3 My type of contract is a: ☐ Fixed contract at ING ☐ Flexible contract at ING

21.4 Age:

21.5 Average number of working hours per week:

21.6 If possible, I would like to work either more ór less hours on a weekly basis, and with that I'm thinking about the following number of hours: ☐ More hours ☐ The same amount of hours ☐ Less hours ☐ The amount of hours I would like to work is: ...

21. Demographics [Continue]

21.7 Time employed within this team (years, months or weeks)

21.8 Time employed within ING (years, months or weeks)

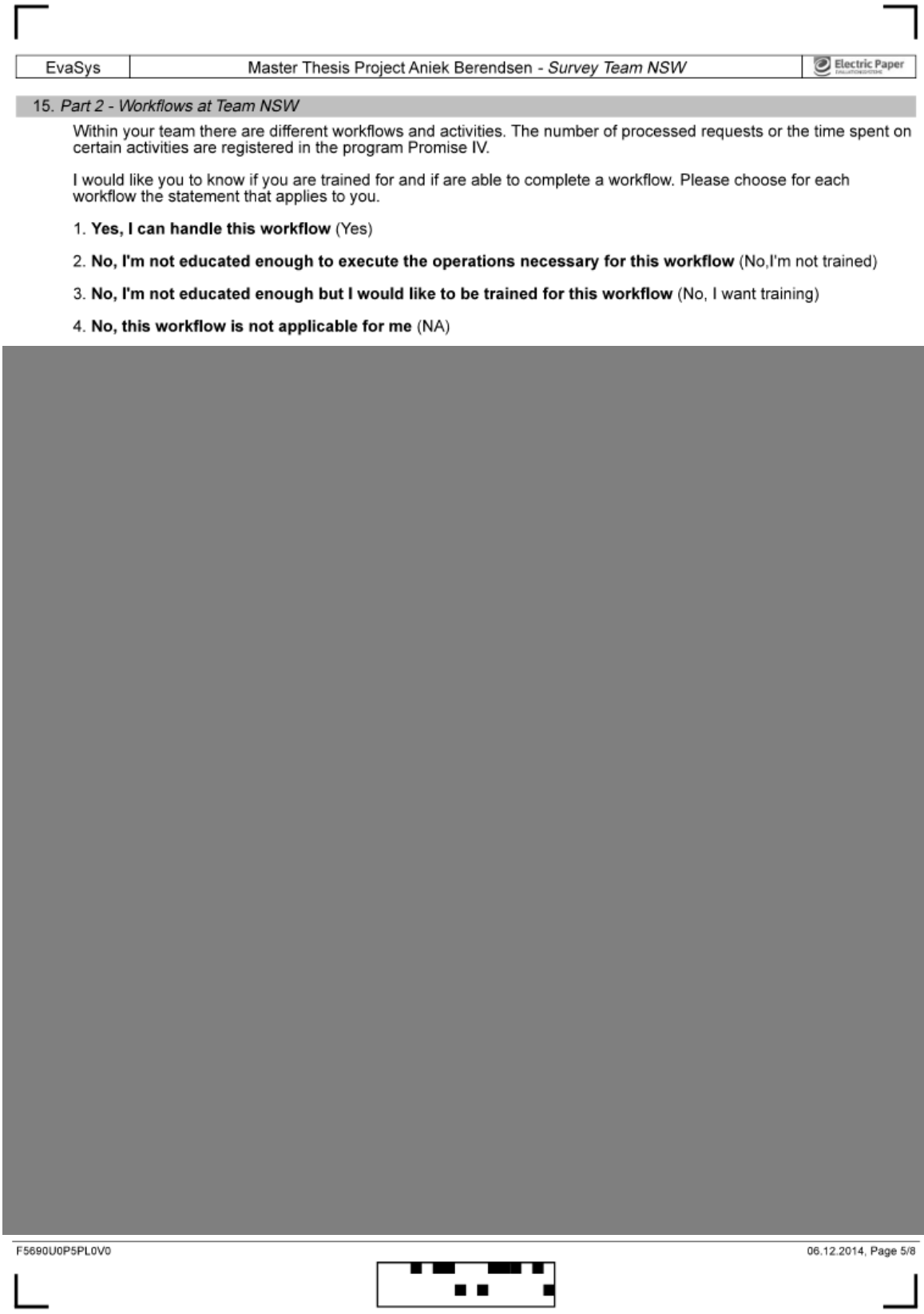
22. Other tips, comments or suggestions

22.1 Do you have any other tips, comments or suggestions?

Thank you for completing this survey!

A1.2 Survey Control Group

For the control group the same survey is used, except from part 2 which concerns their specific workflows.



EvaSys | Master Thesis Project Aniek Berendsen - *Survey Team NSW* | Electric Paper

15. *Part 2 - Workflows at Team NSW*

Within your team there are different workflows and activities. The number of processed requests or the time spent on certain activities are registered in the program Promise IV.

I would like you to know if you are trained for and if are able to complete a workflow. Please choose for each workflow the statement that applies to you.

1. **Yes, I can handle this workflow** (Yes)
2. **No, I'm not educated enough to execute the operations necessary for this workflow** (No,I'm not trained)
3. **No, I'm not educated enough but I would like to be trained for this workflow** (No, I want training)
4. **No, this workflow is not applicable for me** (NA)

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A2. Interview Format

To achieve better insight in the problem analysis of self-managing teams, the quantitative findings of the performance measurements and the survey are checked and accomplished with information from interviews. This appendix discusses the interview format that is developed for the semi-structured interviews at ING Operational Services. A second part of this appendix covers the interview results and is to be found in the Confidential Appendix CA6.

Face to face interviews are conducted with 10 self-managing team members and one interview with a senior employee and the team manager. All interviews are conducted in three days and each interview took approximately half an hour each. For each of the interviews the following structure is used as a guideline, as these interviews are of semi-structured character. By means of semi-structured interviews, it can be safeguarded during the interview that information is gathered for all five issues while it also enables the interviewee to give extra information on what he or he sees as most important.

In all interviews, the structure is as follows. First, the context of the research is explained and accordingly it is described what the interviewee can expect from the interview. The interviews itself are then divided in five issues, for which introducing questions are formulated. However, during the interview the structure is adapted to a logical structure for the interview wherefore it is decided which residual questions are relevant based on the responses given by the interviewee. These residual questions can be relevant if the interviewee did not include them in their answers already or if they did not substantiate their answer sufficiently. The interview format used for the interviews is as follows.

Interviewer: Aniek Berendsen
Date: ……
Time: ……
Interviewee: ……
Super7 Team: ……
Sub-Division: ……

1) Process Mapping
Validate process map
a. Does the process map visualize the relevant workflows and activities of your team correctly? If not, where should something be changed or added?
- Walkthrough process map
- Additions
- Corrections
- Dependencies

Identify potential bottlenecks
b. Are there bottlenecks in the workflows and activities of your team and could you indicate where and when in the process these take place?
- Workflows
- Autonomy
- Competence
- Relatedness
- Enjoyment & Motivation
- Insight in Managerial Goals

Identify successes
c. Are there activities or processes in your team in which the team excels?
- Workflows
- Autonomy
- Competence
- Relatedness
- Enjoyment & Motivation
- Insight in Managerial Goals

2) Competences

All-round trained employees

a. In your opinion, is it valuable and required that all colleagues of the team are trained all-round? Could you explain for what reason this is or is not important?

- Awareness of skill matrix
- Initiative for training

Training program

b. In your opinion, is the training program sufficient to train colleagues of the team all-round?

- Agreements made about the training
- Trainers
- Career path
- Something to be proud of / Room for improvement

Flexibility

c. In your opinion, are your colleagues of the team flexible in their tasks & hours?

- Working hours
- Workflows
- Reasons for flexibility or in-flexibility
- Something to be proud of / Room for improvement

Adaptability

d. In your opinion, do you colleagues of the team easily adapt to contingencies?

- Kind of contingencies
- Behavior
- Something to be proud of / Room for improvement

Communication

e. In your opinion, how is the communication within your team?

- Among colleagues
- With team manager
- Way of communication
- Daily, weekly, monthly meetings
- Something to be proud of / Room for improvement

3) Autonomy

Role team & team manager

a. Within your team, what is considered to be the responsibility of the team and what of the team manager?

- Performances on managerial goals
- Soft skills
- Collaboration
- Ambiguities
- Something to be proud of / Room for improvement

Insight team performance

c. Does the team reflect on her performances and on which indicators do they score their performance?

- Managerial goals
- Soft skills
- Collaboration
- Way of reflection
- Something to be proud of / Room for improvement

Responsibility

d. In what way and to what extent does the team feel responsible for their performance?

- Managerial goals
- Soft skills
- Reflection on individual and team responsibility
- Something to be proud of / Room for improvement

Hierarchy or roles
b. Do you experience a hierarchy within a team or do people take certain roles, either formally or informally?
- Team captain
- Planning, forecast
- Work experience
- Personality

4) Relatedness
Ambience
a. How would you describe the ambience in the team?
- Strengthening the ambience
- Screw up a good ambience
- Team spirit
- Encouragement to perform
- Team activities
- Experiences in other teams
- Something to be proud of / Room for improvement

Personal goals
b. What is for you important in your work?
- Personal goals
- Organizational goals
- Challenging
- Satisfying

5) Motivation & Enjoyment
Motivation
d. How are you motivated to perform as an individual and how to perform as a team?
- Appreciation and recognition of individual effort
- Feedback
- Type of motivation
- Something to be proud of / Room for improvement

Enjoyment
b. Do you and your colleagues enjoy going to work?
- Pleasure, fun
- Personal goals
- Match with company goals
- Most fun experience in this team
- Something you like most about your work

A3. Performance Measurement Method

To measure the performance of self-managing teams, target outcomes and metrics are defined. This appendix gives an overview of the metrics to measure the performance in terms of efficiency, quality and inventory control. In addition, an explanation is given on how to read the performance graphs that are composed by these metrics. Some of the performance graphs are included in the main text, whereas the results of the performance measurements are to be found in the Confidential Appendix CA7.

A3.1 Efficiency and Exploratory Factors

Efficiency is the ratio of the productivity in the netto deployed fte. The target outcome is a set percentage for this ratio, referred to as PIAT-norm which comes from the Dutch norm 'Productie in Aanwezige Tijd'. The efficiency target is different for each self-managing team, depending on their initial base line performance at the time of determining the PIAT target. Therefore, for the gamified intervention the target outcome for efficiency is an increase with respect to their baseline performances. The metrics for efficiency and exploratory factors is as follows.

Metrics

- **Efficiency** **[%]**
  *Deployment standarized production / Fte netto * 100%*
  - Deployment standarized production [hour]
    *Standarized production * Norm standardized production*
    - Standarized production [unit]
    - Norm standardized production [hour/unit]
  - Fte netto [hour]
    *Fte netto * 36 hours*

- **Fte Deployment** **[fte]**
  Fte bruto + Fte netto + Absenteeism + Leave
  - Fte bruto (including absenteeism and leave) [fte]
  - Fte netto (excluding absenteeism and leave) [fte]
  - Absenteeism [fte]
  - Leave [fte]

- **Productivity** **[units/hour]**
  Standarized production / Deployment standardized production
  - Standarized production [unit]
  - Deployment standardized production [hour]

- **Utilization of fte netto** **[hour]**
  Deployment standardized production + Deployment non-standardized production + Deployment other production + Deployment regulatory tasks
  - Deployment standardized production [hour]
  - Deployment non-standardized production [hour]
  - Deployment other production [hour]
  - Deployment regulatory tasks [hour]

- **Deployment regulatory tasks** **[hour]**
  Deployement quality control + Deployment management support + Deployment training + Deployment consultation + Deployment projects + Deployment systems failure
  - Deployment quality control [hour]
  - Deployment management support [hour]
  - Deployment training [hour]
  - Deployment consultation [hour]
  - Deployment projects [hour]
  - Deployment systems failure [hour]

At ING, a performance management tool Promise IV is used to gather the data of the number of client requests processed and the division of working hours among the different types of production per person and per self-managing team. As the whole organization works with this Tool build in the Access application of Microsoft Office, this tool requires quite some loading time. Therefore, many employees use post-its or their own Word of Excel document to keep track of their processed client requests and their hours. At the end of the day, they start of the performance management tool to fill in the data. This data is used to assess their performances with respect to their efficiency target outcome.

At ING Operational Services, the target outcome for the efficiency of each self-managing team is set at 18 percent increase with respect to the self-managing teams' baseline efficiency performance. The target outcome of 18 percent increase is determined in an earlier stage by higher management. This results in a different efficiency target outcome for each self-managing team and a different baseline performance for this research, as some self-managing teams already showed an increase in efficiency and some did not show efficiency improvement at all. Also, as some self-managing teams may have been performing well already at the moment of the baseline measurement, the target of 18 percent increase in terms of efficiency may be an unrealistic target outcome. Whereas the target outcome would be easier to achieve for the underperforming teams. Therefore, as the defined target outcome in terms of efficiency by management is not equally feasible for all self-managing teams and therewith not applicable for comparison between teams, the target outcome for efficiency is defined as any increase in efficiency with respect to their baseline performance while having the original target in mind.

A3.2 Quality

The strategy of ING Operational Service is customer focused, they strive for optimal customer service and therewith error free processing of customer requests. Therefore, the quality target outcome is 100%. Quality is valued by the errors made in the processing of the customer requests. The target outcome is a completely error free processing of customer requests. Each self-managing team executes their own quality control checks. The self-assessment takes place by administrating the errors found per checks per workflow. Next to the self-assessment, complaints arrive via the central complaints administration. However, these complaints are not taken into account for this research as this data was not available for both researched self-managing teams and also cannot be traced back to the specific error, date and employee within ING Operational Services. The metrics for measuring the quality is as follows.

Metrics

- **Quality** **[%]**
  *100 – (Requests with errors found / Requests checked * 100%)*
  - Requests with errors found [request]
    - Errors found workflow 1 [request]
    - Errors found workflow 2 [request]
    - Errors found workflow N [request]
  - Requests checked [request]

A3.3 Inventory Control (TITO)

The inventory control aims at handling all customer requests the same day also referred to as the Today in Today out (TITO) principle. Self-managing teams send an email to their team manager if they do not process all customer requests the same day and therewith the inventory control is also checked by a self-assessment. All self-managing teams should be able to work TITO due their flexible working hours. The TITO inventory control is measured by the following metrics.

Metrics

- **All daily requests processed** **[Yes/No]**
  All physical requests processed + All mailbox requests processed + Scanned requests 100% processed
  - All physical requests processed [Yes/No]
  - All mailbox requests processed (until 19h00) [Yes/No]
  - Scanned requests 100% processed [Yes/No]

The inventory control is focused on the today in, today out principle which accounts for all incoming requests up to 19h00. Incoming requests come in either via physical post from Post@ING or via digital post in mailboxes. For the researched self-managing teams, only a part of the requests are scanned into an inventory control system as incoming and processed requests. As this inventory control system only covers a part of all requests, one team member of the self-managing team checks around 20h00 if all physical requests, mailbox requests and scanned requests that arrived before 19h00 are processed.

A3.4 How to Read the Graphs of the Performance Measurements

The metrics for efficiency as explained in CA1.1 are used to develop graphs that illustrate the efficiency performance. The metrics for quality of service and inventory control are also used for the developed of performance graphs, but these graphs are explained in the results of both gamified interventions. Therefore some general information is given for the performance measurement and in more detail it is explained how to read the graphs for efficiency performance.

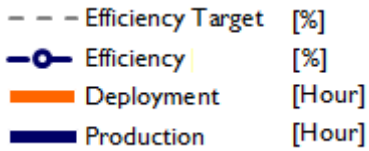
The performance measurements are conducted for two gamified interventions. The first gamified intervention took place in December 2014, week 50 and 51. In order to analyze the performance, the performance during the 5 weeks in advance are studied. These 5 weeks are used for both the problem analysis and the baseline measurement of the first gamified intervention. To analyze the performance after the gamified intervention, two weeks after the gamified intervention are included in the performance measurement. The performances of two self-managing teams who existed of one experimental group and one control group. The experimental group is the self-managing team that participated in the gamified intervention during two weeks. The control group did not participate in the gamified intervention but they did receive the feedback on their performance and the same amount of attention by the researcher. For each self-managing team an efficiency target is set. These targets depend on their potential for efficiency performance as identified by operational excellence consultants and higher management of ING Operational Services. Next to these two self-managing teams, the performance of division are analysed. The division exists of 46 self-managing teams and the total data of these self-managing teams are used in the performance graphs. The efficiency targets are to be found in the confidential appendix.

The second gamified intervention took place in Februari 2015. In the weeks 7 and 8 the research was conducted, whereas in week 9 and 10 the self-managing team and the team manager continued to use the gamified intervention in their daily work. Therefore, the performances in these four weeks are studied, next to five reference weeks in advance. As the week 10 was at the end of this research, it was not possible to study weeks after the second gamified intervention took place. For the second gamified intervention, two experimental groups are used that worked with the gamified intervention. No control group is studied, as the results of total division give enough information to benchmark the performance. Two important remarks for the graphs of the second gamified intervention. First, it is important to know that at the start of 2015 targets and norms are revised. Therefore the performance graphs of the first and second gamified intervention should only be compared by their trends and not for the specific numbers. Second, it is important to know that two self-managing teams merged into the second experimental group in week 6. Therewith the first experimental group was more experienced with the gamification design as they participated in the first gamified intervention too and in addition they were a more stable team. The second experimental group participated for the first time in the second gamified intervention and was a very new team.

To illustrate the efficiency performance, three graphs are developed which are the graphs for efficiency, the division of the working hours and the time spend on regulatory tasks. Each type of graphs is developed for the performance per week and the performance per day during the gamified intervention. The graphs are developed for the division and the two participating self-managing teams in both gamified interventions.

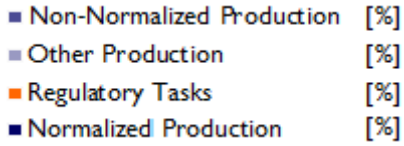
Graphs of Efficiency

As the metrics in A3.1 explains, the efficiency is calculated as a ratio of the deployment in working hours and the production hours. Therefore the graphs give an overview of the netto deployed fte by orange bars and the production hours by blue bars. The ratio of these two bars is illustrated by the blue dotted line which visualized the efficiency percentage. In the graphs, the trend over respectively the weeks or days is illustrated.



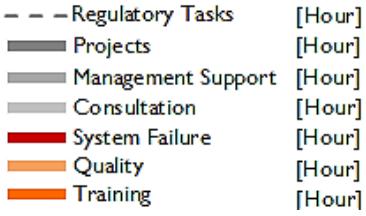
Graphs of Division of Working Hours

The division of working hours shows how the total working hours per week are spread over the three types of production and the regulatory tasks. As the metrics in A3.1 explains, ideally the non-normalized production is optimized. The division of working hours shows if the team is spending a lot of their time or regulatory tasks. If they are spending a lot of their time on other production, they should put effort in defining these activities as workflows. Next to defining the activities, the self-managing teams can also suggest norms for their workflows by with they can move their activities from non-normalized production or other production to the normalized production, which they aim to optimize.



Graphs of Regulatory Tasks

The graphs for regulatory tasks illustrate the total number of hours spend on regulatory tasks. Next to the total number, also the hours for each regulatory is illustrated. Therewith more insight in gained in the working hours of self-managing teams. If they are spending a lot of time on meeting and their consultation hours are high, they should consider reducing these hours. The graph also gives insight in the division of the regulatory tasks per day and over the weeks. Especially looking on a daily basis, might explain their efficiency scores. For example, a training day of 8 hours might result in a low efficiency score as less time is spend on production compared to the netto deployed fte



A4. Job Satisfaction Measurement Method

To measure the job satisfaction of the self-managing teams, a standardized questionnaire is used as this use is validated by previous studies. The results of the job satisfaction measurements are to be found in the Confidential Appendix CA8. For this research, the standardized questionnaire (Ferreira, 2009) based on the Zurich Model of job satisfaction (Bruggemann, et al., 1975) is used to assess the job satisfaction. From 1975 the model suggested by Bruggemann is evaluated and adapted by Ferreira, resulting in a useful and validated questionnaire to assess the job satisfaction. With the questionnaire, different satisfaction types can be identified. The job satisfaction types give qualitative information of the type of job satisfaction, whereas a quantitative scoring gives information on an increase of decrease in job satisfaction. However the choice is made to use job satisfaction types, as it is a also argued that a quantitative scoring always indicates that employees are quite satisfied (Ferreira, 2009).

Previous studies using this job satisfaction measurement method state that job satisfaction types are not permanent and that organization should be forward-looking to work out what initiates the desired change. In order to explain the job satisfaction types, this appendix first provides an overview of the key variables that are used to construct the job satisfaction types and accordingly presents the 36 defined types. Next, the standardized questionnaire is presented that is used for the job satisfaction measurement. The results of the job satisfaction measurement are discusses in chapter 7 as the result of the second gamified intervention.

A4.1 Method to score Job Satisfaction

The job satisfaction is measured by four key variables. The first variable is measured by 22 question blocks, which represents the so-called 'Soll-Ist-Wert-Vergleich' or in other words a comparison between the desired and actual situation at work. The second key variable addresses the availability of controllability of changes at work. The third addresses the goals and demand of work and the change of it, whereas the fourth accesses the problem solving of the employee at work.

First Key Variable
The first variable is measured by 22 question blocks, whereby each question block exists of three questions. The first question represents the desired situation, the second question the importance factor and the third question the actual situation. For each question a mark is given on a 5 point scale. Accordingly, for each question group the difference between the desired and actual situation can be determined, by subtracting the score for the desired situation from the current situation which results in a number in the range of -4 and +4. A difference of 0 equals congruence, a negative difference to a negative discrepancy and a positive difference to positive discrepancy.

The score for a negative and positive discrepancy are multiplied by the importance factor, asked in the second question. Therewith, the score for each question block can range between –20 and +20 as the maximum difference of 4 between the desired and actual situation can be multiplied with an importance factor of 1 to 5. As the first variable is determined by 22 question blocks, the maximum score for ranges between 22 times -20 and +20, resulting in a range between -440 and +440. The more negative the final grade is, the more negative discrepancy is present and the same goes for positive discrepancy. The closer the grade is to 0, the more congruence is present between the current and desired situation at work. The range for congruence lies between -33 and + 33, which is calculated by taking the same proportional size of the key variable range as is done in the original method (Ferreira, 2009b). The total score for the first key variable results in a final score for either congruence, negative discrepancy or positive discrepancy.

Score First Key Variable

Negative Discrepancy (-1)	-440 till -33
Congruent (0)	-33 till + 33
Positive Discrepancy (+1)	+33 till +440

Second Key Variable

The second key variable addresses the perceived level of control by three questions groups, whereby each question group exists of two questions. For each question the employee indicates if he has limited, equal or many possibilities to influence the observed change in perceived level of control. Therewith these questions address the observed change in perceived level of control in a qualitative form. The second question of the question group, addresses the perceived level of control. The final scale for the second key variable is expressed in controllability available and controllability unavailable. For each question, the scores on the range of 1 to 5 are compared. The higher the grade, the higher the perceived level of control. The grades of the six questions are added to each other, which results in a range for controllability between 6 and 30. The range of 6 till 18 are defined as controllability available, the range from 19 till 30 as controllability unavailable. For the second key variable, no mean control perception is defined.

Score Second Key Variable	
Available (1)	6-18
Unavailable (-1)	19-30

Third Key Variable

The third key variable addresses the goals and demand of work and the change of it. This variable is measured by two question groups of each two questions on a 1 to 5 scale. The sum of the first and third question determines the score, whereas the second and fourth question gives qualitative information. The scores for the third variable can range between 2 and 10, whereas 2-5 is defined as a decreasing, 6 is defined as maintaining and 7-10 is defined as increasing goals and demand of work.

Score Third Key Variable	
Decreasing (-1)	2-5
Maintaining (0)	6
Increasing (+1)	7-10

Fourth Key Variable

The fourth kern variable addresses the problem solving requests with four questions. All four questions are rated on a 5 points scale. The scores for the four questions are added, therewith the range for the fourth kern variable is between 4 till 20. The scores between 4 till 12 are defined as lack of problem-solving, the scores between 13 till 20 as existing problem-solving.

Score Fourth Key Variable	
Lack of Problem-solving (-1)	4-12
Existing Problem-solving (+1)	13-20

Job Satisfaction Types

From the four key variables, the job satisfaction types are determined. If someone changes from job satisfaction type, it can be analyzed which key variable was of influence for this change. Two extremes in the job satisfaction types are the motivated balancing-oriented, number 13 and the resignation active type of number 33. These types score respectively positive or negative on all four key variables. To illustrate the change of job satisfaction types, a movement of the motivated balancing oriented job satisfaction type to the progressive constructive can be explained by a change of the first key variable. Therewith in this example the actual working situation might have changed with respect to the desired working situation.

The following table shows how the scores on the four key variables are translated to the job satisfaction types.

ID	Key Variable 1	Key Variable 2	Key Variable 3	Key Variable 4	Job Satisfaction Type
1	0	1	1	1	Classic Progressive
2	0	1	1	-1	Passive progressive
3	0	1	-1	1	Progressive reducing
4	0	1	-1	-1	Passive reducing
5	0	1	0	1	Classic stable passive
6	0	1	0	-1	Progressive frustrated
7	0	-1	1	1	Ambivalent frustrated
8	0	-1	1	-1	Frustrated active
9	0	-1	-1	1	Frustrated passive
10	0	-1	-1	-1	Stable frustrated active
11	0	-1	0	1	Stable frustrated passive
12	0	-1	0	-1	Progressive adaptive
13	1	1	1	1	Motivated balancing-oriented
14	1	1	1	-1	Passive balancing-oriented
15	1	1	-1	1	Balancing-oriented reducing
16	1	1	-1	-1	Reducing passive
17	1	1	0	1	Constant active
18	1	1	0	-1	Constant passive
19	1	-1	1	1	Motivated frustrated
20	1	-1	1	-1	Motivated unstable
21	1	-1	-1	1	Reducing balance-oriented
22	1	-1	-1	-1	Balance-oriented unstable
23	1	-1	0	1	Constant frustrated
24	1	-1	0	-1	Constant unstable
25	-1	1	1	1	Progressive constructive
26	-1	1	1	-1	Passive progressive
27	-1	1	-1	1	Adaptive reducing
28	-1	1	-1	-1	Reductive passive
29	-1	1	0	1	Classic constructive
30	-1	1	0	-1	Constructive passive
31	-1	-1	1	1	Constructive frustrated
32	-1	-1	1	-1	Progressive ambivalent
33	-1	-1	-1	1	Resignation active
34	-1	-1	-1	-1	Classical resignation
35	-1	-1	0	1	Active fixed
36	-1	-1	0	-1	Classic fixed

The standardized questionnaire to determine the scores on the four key variables is presented in the next section.

A4.2 Standardized Questionnaire to score Job Satisfaction

The standardized questionnaire by Ferreira (2009) used in this research to assess job satisfaction is as follows.

In the following, you will find some questions about your job. We would like to know your personal opinion. Therefore, there is no right or wrong answer. Please answer the questions honestly. **Very important:** Please answer every question with exactly one 'x'.

You want from your job …

1	**… that the work pleases you.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
2	**… that your colleagues respect you.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
3	**… that your work challenges you.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
4	**... that you earn enough money.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
5	**... that you have enough free time.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
6	**... that your direct superior recognizes your work.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
7	**... that you have enough vacation time.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
8	**... that you can also discuss private problems.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
9	**... that your colleagues support you.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
10	**... that you can take on responsibility.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
11	**... that you have chances for promotion.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
12	**... that your work makes you content.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
13	**... that you have enough breaks.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
14	**... that your direct superior has time for you.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
15	**... protection against work related illnesses.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
16	**... a well laid-out, nice work station .**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!
17	**... that you could be proud of your company.**	Absolutely not!	❒ ❒ ❒ ❒ ❒	Absolutely!
	How important is this for you?	Completely unimportant!	❒ ❒ ❒ ❒ ❒	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❒ ❒ ❒ ❒ ❒	Completely (100%)!

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You want from your job …

18	**… that you will not be laid off.**	Absolutely not!	❐	❐	❐	❐	❐	Absolutely!
	How important is this for you?	Completely unimportant!	❐	❐	❐	❐	❐	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❐	❐	❐	❐	❐	Completely (100%)!
19	**… an agreeable work station (noise, ventilation …)**	Absolutely not!	❐	❐	❐	❐	❐	Absolutely!
	How important is this for you?	Completely unimportant!	❐	❐	❐	❐	❐	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❐	❐	❐	❐	❐	Completely (100%)!
20	**…to make an important contribution to your company.**	Absolutely not!	❐	❐	❐	❐	❐	Absolutely!
	How important is this for you?	Completely unimportant!	❐	❐	❐	❐	❐	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❐	❐	❐	❐	❐	Completely (100%)!
21	**… orderliness and cleanliness at your work place.**	Absolutely not!	❐	❐	❐	❐	❐	Absolutely!
	How important is this for you?	Completely unimportant!	❐	❐	❐	❐	❐	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❐	❐	❐	❐	❐	Completely (100%)!
22	**… an optimal organization of working time for you.** ..	Absolutely not!	❐	❐	❐	❐	❐	Absolutely!
	How important is this for you?	Completely unimportant!	❐	❐	❐	❐	❐	Absolutely vital!
	Does your actual work situation offer you this?	Not in the slightest	❐	❐	❐	❐	❐	Completely (100%)!

23	Do you have the opportunity to change something, if things are not being properly run at work?	No, never	❐	❐	❐	❐	❐	Yes, always
24	Please assess your **future** possibilities to change something at your work.	I am going to have **noticeably less** possibilities.	❐	❐	❐	❐	❐	I am going to have **noticeably more** possiblities.
25	Does the quality of your work depend only on yourself?	No, never	❐	❐	❐	❐	❐	Yes, always
26	Will the quality of your work change in the near future?	It is going to **noticeably worsen.**	❐	❐	❐	❐	❐	It is going to **noticeably improve.**
27	Can you influence your future or the future of your company through your work?	No, never	❐	❐	❐	❐	❐	Yes, always
28	Will your future or the future of your company change because of your work?	It is going to **noticeably worsen.**	❐	❐	❐	❐	❐	It is going to **noticeably improve.**

29	Do you set personal standards for the work you do (e. g. that your work should be completed especially well or quickly).	No, never	❐	❐	❐	❐	❐	Yes, always
30	Are you going to change these standards in the near future?	They are going to **noticeably fall.**	❐	❐	❐	❐	❐	They are going to **noticeably rise.**
31	Do you set **personal** goals for your work?	No, never	❐	❐	❐	❐	❐	Yes, always
32	What are you going to do once you have reached your goals?	I am **not** going to set new goals.	❐	❐	❐	❐	❐	I am going to set new goals **at once.**

33	If you have problems at your work station, do you attempt to find a solution yourself?	No, never	❐	❐	❐	❐	❐	Yes, always
34	Are you going to try to change something at your actual work situation in the near future?	Definitely not	❐	❐	❐	❐	❐	Definitely
35	Have you actively changed something at your actual work situation lately?	No, I changed **nothing.**	❐	❐	❐	❐	❐	Yes, I **radically** changed something.
36	Do you use your current knowledge to solve problems at your work station?	No, never	❐	❐	❐	❐	❐	Yes, always

A5. Motivational Needs Satisfaction Measurement Method

This appendix shows the measurement method of the motivational need satisfaction, whereas the results are to be found in the Confidential Appendix CA9. To determine the motivational need satisfaction, the self-determination theory is chosen as a theoretical framework as this theory is an already well-established theory to understand motivational aspects. Furthermore the self-determination theory brings forth a way to qualify motivation in a more informative way than just being defined as high or low. Therewith better insights can be gained of the possible impact of gamification upon players' motivation and clear tools to design with. According to the self-determination theory one should experience perceived autonomy and competence for intrinsic motivation, whereas for extrinsic motivation also relatedness should be perceived (Ryan & Deci, 2000a).

The basic need satisfaction is a family of scales, as a scale for addressing the need satisfaction in general or others that address the need satisfaction in specific domains (Deci & Ryan, 1985). For this research, the basic need satisfaction at work scale is relevant as it is a standardized and validated questionnaire by it use in a variety of previous research (Deci, et al., 2001); (Ilardi, et al., 1993); (Kasser, et al., 1992). The questionnaire has twenty-one items concerning the three needs for competence, autonomy, and relatedness. The original questionnaire worked with a seven-point Likert-type scale. However for this research, the same questions but with a fifth-point Likert-type scale was used in order to align the questions from the motivational needs questionnaire with other used questionnaires of this research. This appendix presents the used questionnaire to score the need satisfaction before and after the second gamified intervention.

A5.1 Standardized Questionnaire

The standardized questionnaire used for this research with the adapt Likert-type scale from a 7 to 5 points scale is as follows. This questionnaire is used for the baseline measurement of the second gamified intervention.

Basic Need Satisfaction at Work

When I Am At Work
The following questions concern your feelings about your job during the last year. (If you have been on this job for less than a year, this concerns the entire time you have been at this job.) Please indicate how true each of the following statement is for you given your experiences on this job. Remember that your boss will never know how you responded to the questions. Please use the following scale in responding to the items.

1	2	3	4	5
totally not true		somewhat true		totally true

1. I feel like I can make a lot of inputs to deciding how my job gets done
2. I really like the people I work with
3. I do not feel very competent when I am at work
4. People at work tell me I am good at what I do
5. I feel pressured at work
6. I get along with people at work
7. I pretty much keep to myself when I am at work
8. I am free to express my ideas and opinions on the job
9. I consider the people I work with to be my friends
10. I have been able to learn interesting new skills on my job
11. When I am at work, I have to do what I am told
12. Most days I feel a sense of accomplishment from working
13. My feelings are taken into consideration at work
14. On my job I do not get much of a chance to show how capable I am
15. People at work care about me

16. There are not many people at work that I am close to
17. I feel like I can pretty much be myself at work
18. The people I work with do not seem to like me much
19. When I am working I often do not feel very capable
20. There is not much opportunity for me to decide for myself how to go about my work
21. People at work are pretty friendly towards me

Scoring Information
A scale for autonomy, competence and relatedness are formed to score the motivational need satisfaction. The subscale scores are determined by averaging the responses for each of the following question numbers.

Autonomy: 1, 5(R), 8, 11(R), 13, 17, 20(R)
Competence: 3(R), 4, 10, 12, 14(R), 19(R)
Relatedness: 2, 6, 7(R), 9, 15, 16(R), 18(R), 21

(R) stands for reverse scoring which is used for the questions that are worded in the negative direction. By subtracting the response from 6, the reverse score is determined.

A5.2 Ranking of Motivational Affordances for Motivational Needs Satisfaction

To determine the relation between the motivational affordances and the motivational needs, the following questionnaire is used. The ranking of the motivational affordances of compete, challenge, empathize and explore is questioned per item, whereas the scoring on the items determines the score on perceived autonomy, competence and relatedness. Also for this questionnaire, the Likert-type scale is set from 7 to a 5 points scale. The questionnaire is used for the measurement after the second gamified intervention.

Basic Need Satisfaction at Work

When I Am At Work
The following questions concern your feelings about your job during the last year. (If you have been on this job for less than a year, this concerns the entire time you have been at this job.) Please indicate how true each of the following statement is for you given your experiences on this job. Remember that your boss will never know how you responded to the questions. Please use the following scale in responding to the items.

1 2 3 4 5
totally not true somewhat true totally true

1. I feel like I can make a lot of inputs to deciding how my job gets done
   Rank the competition, challenge, empathize and explore according to its contribution
   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

2. I really like the people I work with
   Rank the competition, challenge, empathize and explore according to its contribution
   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

3. I do not feel very competent when I am at work

   Rank the competition, challenge, empathize and explore according to its contribution

   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

4. People at work tell me I am good at what I do

   Rank the competition, challenge, empathize and explore according to its contribution

   1. ……..
   2. ……..
   3. ……..
   4. ……..

5. I feel pressured at work

   Rank the competition, challenge, empathize and explore according to its contribution

   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

6. I get along with people at work

   Rank the competition, challenge, empathize and explore according to its contribution

   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

7. I pretty much keep to myself when I am at work

   Rank the competition, challenge, empathize and explore according to its contribution

   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

8. I am free to express my ideas and opinions on the job

   Rank the competition, challenge, empathize and explore according to its contribution

   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

9. I consider the people I work with to be my friends

   Rank the competition, challenge, empathize and explore according to its contribution

   1. …….. *(most contributing)*
   2. ……..
   3. ……..
   4. …….. *(least contributing)*

10. I have been able to learn interesting new skills on my job

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

11. When I am at work, I have to do what I am told

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

12. Most days I feel a sense of accomplishment from working

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

13. My feelings are taken into consideration at work

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

14. On my job I do not get much of a chance to show how capable I am

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

15. People at work care about me

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

16. There are not many people at work that I am close to

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

17. I feel like I can pretty much be myself at work

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

18. The people I work with do not seem to like me much

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

19. When I am working I often do not feel very capable

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

20. There is not much opportunity for me to decide for myself how to go about my work

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

21. People at work are pretty friendly towards me

    Rank the competition, challenge, empathize and explore according to its contribution

    1. …….. *(most contributing)*
    2. ……..
    3. ……..
    4. …….. *(least contributing)*

Scoring Information

A scale for autonomy, competence and relatedness are formed to score the motivational need satisfaction. The subscale scores are determined by averaging the responses for each of the following question numbers.

Autonomy: 1, 5(R), 8, 11(R), 13, 17, 20(R)
Competence: 3(R), 4, 10, 12, 14(R), 19(R)
Relatedness: 2, 6, 7(R), 9, 15, 16(R), 18(R), 21

(R) stands for reverse scoring which is used for the questions that are worded in the negative direction. By subtracting the response from 6, the reverse score is determined.

The ranking is determined by adding up the ranking scores for each motivational affordance per scale of autonomy, competence and relatedness.

A6. Developed Survey for the Final Evaluation

To evaluate the second gamification design and the gamified intervention, a survey is developed. The results of the survey are included in the Confidential Appendix CA10. The survey is developed to evaluate the usability, usefulness and potential usefulness. Special attention is paid to the motivational affordances of the gamification design. The survey results are used as basis for the evaluation session with both self-managing teams by which qualitative information could be gathered.

For the survey, 24 items are developed to evaluate the usability, usefulness and potential usefulness. Next to these 24 items, 5 open questions are added to gain a better understanding of their responses. The respondents are asked to score each item on the following scale:

1	2	3	4
Totally agree	Agree	Disagree	Totally disagree

Part 1

1. I liked to work with Sweet Tea / Oranje Koffiecorner
2. In my opinion working with Sweet Tea / Oranje Koffiecorner was motivating
3. I would like to work with Sweet Tea / Oranje Koffiecorner again
4. I (now) value Sweet Tea / Oranje Koffiecorner as useful
5. In my opinion it is valuable if other Super7s also start with Sweet Tea / Oranje Koffiecorner
6. I felt empathized with the storyline of Sweet Tea / Oranje Koffiecorner
7. My colleagues felt empathized with the storyline of Sweet Tea / Oranje Koffiecorner
8. The metaphor of a running our own company was appealing to me

Part 2

9. Sweet Tea / Oranje Koffiecorner corner gave a better understanding of our performance than we had before
10. Sweet Tea / Oranje Koffiecorner challenged us to win the league
11. Sweet Tea / Oranje Koffiecorner everyday us to be profitable daily
12. Sweet Tea / Oranje Koffiecorner made sure we were thinking about our customers and customer satisfaction
13. Sweet Tea / Oranje Koffiecorner made sure we found out more about how to send our team performance

Part 3

14. By Sweet Tea / Oranje Koffiecorner corner we have changed something in our work as Super7
15. Sweet Tea / Oranje Koffiecorner had an impact on our team performance
16. By means of Sweet Tea / Oranje Koffiecorner more things were discussed within the team
17. Sweet Tea / Oranje Koffiecorner enhanced the transparency in our work
18. Sweet Tea / Oranje Koffiecorner was motivating to perform well in our work

Part 4

19. The aim of participating in Sweet Tea / Oranje Koffiecorner was clear to me
20. The instructions and explanations were clear
21. The interim feedback was good
22. The role of the Team Manager must be of greater importance in Sweet Tea / Orange Coffee Corner
23. Without a price I would have found working with Sweet Tea / Oranje Koffiecorner equally useful
24. The ease of use of Sweet Tea / Oranje Koffiecorner was alright

Part 5

25. In my opinion the nicest thing about working with Sweet Tea / Oranje Koffiecorner is: ...
26. In my opinion the most valuable of Sweet Tea / Oranje Koffiecorner is: ...
27. I would like to see the followed improved in Sweet Tea / Oranje Koffiecorner: ...
28. I would like to see the following included in Sweet Tea / Oranje Koffiecorner: ...
29. Do you want to share something else? ...

A7. First Gamification Design

The first gamification design is designed according to the gamification design process by Deterding (Deterding, 2014c). This appendix presents the technical design choices and the first gamification design by its front-end, screen and back-end.

A7.1 Development Platform

To develop the application and to store information, several technical design choices are made. The development platform, compatible programming language and database are chosen. To choose a development platform four well-known platforms are considered, as due to their widespread use high level documentation and support are available. In order to choose the best suitable development platform, the characteristics of the platforms are listed.

Type of Development Platform	Application	Programming Language	Advantages	Drawbacks
Microsoft Office	Electronic spread-sheet application Excel & relational database application Access	Visual Basic Applications	Enables calculations and data management; Licences available in many enterprises; Easy to use	Constraints flexibility and creativity; 2D oriented; Single user oriented
Game Engine Unity	Online application, Standalone desktop application	Java, C#, C++	Asset Store enables easy development; Supports creative design being 2D and 3D oriented; Single and multi-user oriented	Installation on computer required; Calculations by variables and functions in code; Relational database management system needed
Adobe Flash Player	Online application, Standalone desktop application	ActionScript 3	Supports creative design being 2D and 3D oriented	Download plug-in, requires recent versions of browsers; Single user oriented; Calculations by variables and functions in code; Relational database management system needed
World Wide Web	Online application, Standalone desktop application	HTML5, Hypertext Preprocessor (PHP)	Supports creative design being 2D and 3D oriented; Single and multi-user oriented	Calculations by variables and functions in code; Relational database management system needed

The office software developed by Microsoft, is a widely used office software and is also in use by ING. For the gamified application the most interesting applications are the electronic spreadsheet application Excel and the relational database application Access. This allows for calculations and data management. It also holds potential to further integrate the gamified application with other Microsoft Office applications as the personal information manager Outlook, which on its turn can be linked to third-party add-on applications as for instance the telecommunications application software Skype. Although this software package facilitates calculations, data management, easy acceptance and use, it also limits flexibility and creativity and therewith room for a gameful experience.

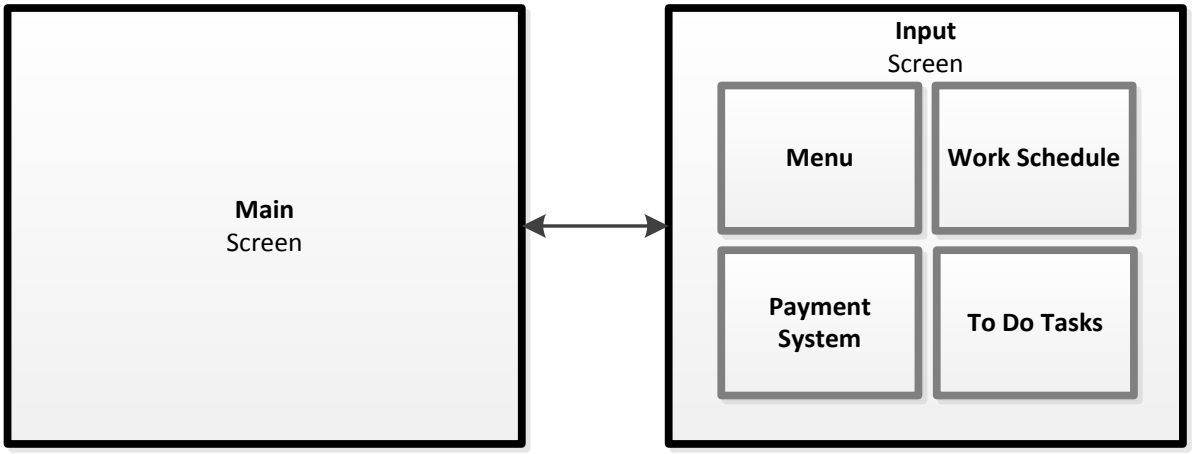
Game engines are software frameworks designed for easy coding, creation and development of games. By using game engines, the code does not have to be built from the ground up. Designers can make use of the existing software framework and asset stores. A well-known game engine that is used in a variety of (serious) games is Unity. To build the code up from the ground, Adobe Flash Player and the World Wide Web can be used. This requires more programming skills, but also results in more flexibility and creativity enabled in the design. The online applications or desktop applications created either by Unity, Adobe Flash Player or on the World Wide

Web are 2D and 3D oriented and therewith also support video games. As they are mainly focused on the creation of gameful experiences, calculations need to be put in code. Furthermore, all should make use of either a commercial or open source relational database system. Next to Microsoft, commercial relational databases are Oracle and IBM. A widely used open source relational database management system is MySQL. Microsoft Office Applications, as well as Unity, Adobe Flash Player and the World Wide Web applications can be developed for Windows, Windows Phone, Mac OS X, iOS en Android.

For this research, Microsoft Office Applications are chosen as the development platform for the gamified application. First, because the application Excel enables to do calculations needed for the gamified application in an easy manner. Second, because the application Access has already a relational database in place and even more important, which can also be linked easily with the existing databases in Access at ING. Third, although the software package limits the out of the box game design by its pre-defined applications, their programming language enables the designer to build a customized application that still supports a gameful experience. Fourth, taken knowledge level of the designer regarding the required programming languages into account, Visual Basic for Applications (VBA) is a relative easy to learn programming language being similar to other structured programming languages, which can be used in all applications and all versions of Microsoft Office.

A7.2 Front-end Design

The front end is designed in the Excel applications by making use of spreadsheets. The first worksheet included the main screen, on which the key information is shown regarding the target outcome of the gamified intervention which are the translated to the profitability of the company, the customer satisfaction and the service.

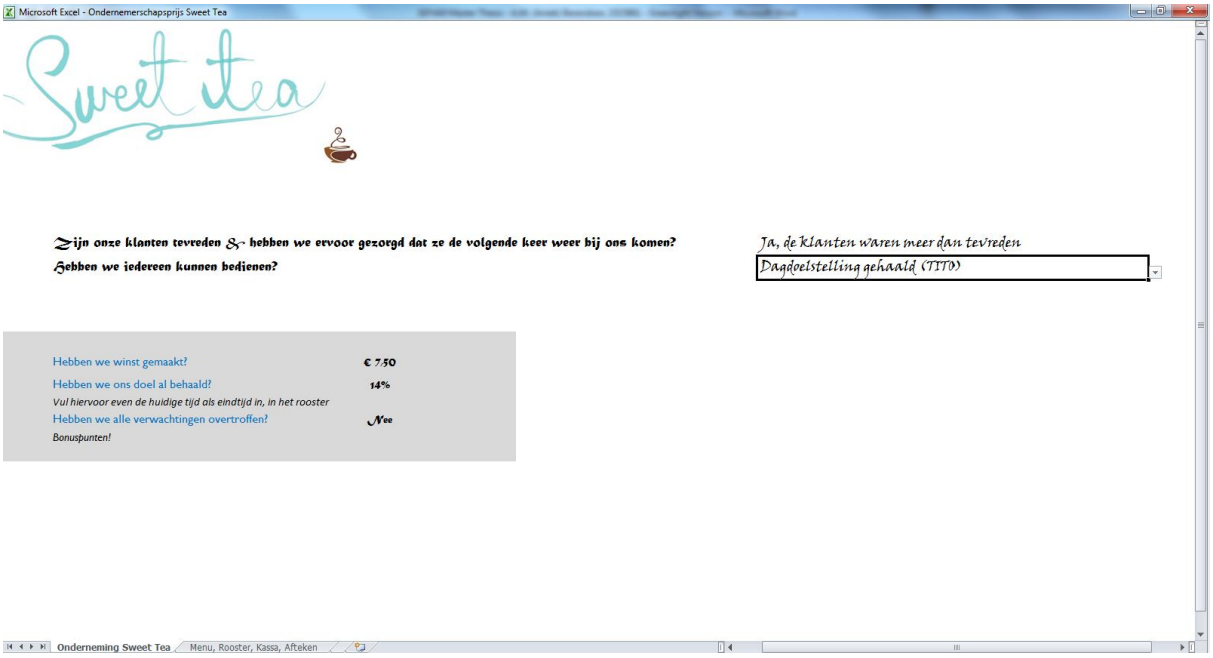


From the main screen, users could like to the input screen on which the target activities are shown that contribute to the target outcomes. The menu represents the workflows and the norms translated to products and prices. The work schedule shows the working hours per employee for which also the translated personnel costs are shown. Furthermore the payment system shows overview of the processes customer requests per workflow per day, which are translated to the sold products and accompanying prices. Lastly, the to do tasks are shown which are the non-normalized production, other production and the regulatory tasks. For the gamification design these are translated to cleaning tasks. The activities of the input screen are linked by means of relational data and if-statements.

A7.3 Screens of Application

The front-end is designed to specific screens, The final design for the main screen and input screen are as follows.

Main Screen



The main screen shows the profitability, customer satisfaction and quality of service. The profitability is calculated by the activities of the input screen, whereas the quality and inventory control is determined by a self-assessment of a self-managing team member. A more detailed description of the design is given in the main body of this report.

Input Screens

The users can input their working hours and processed customer requests, which are linked to the personnel costs of the company and the sold products. The aim of the gamified application is to make profit while keeping the customers satisfied and providing a good service by appropriate inventory control.



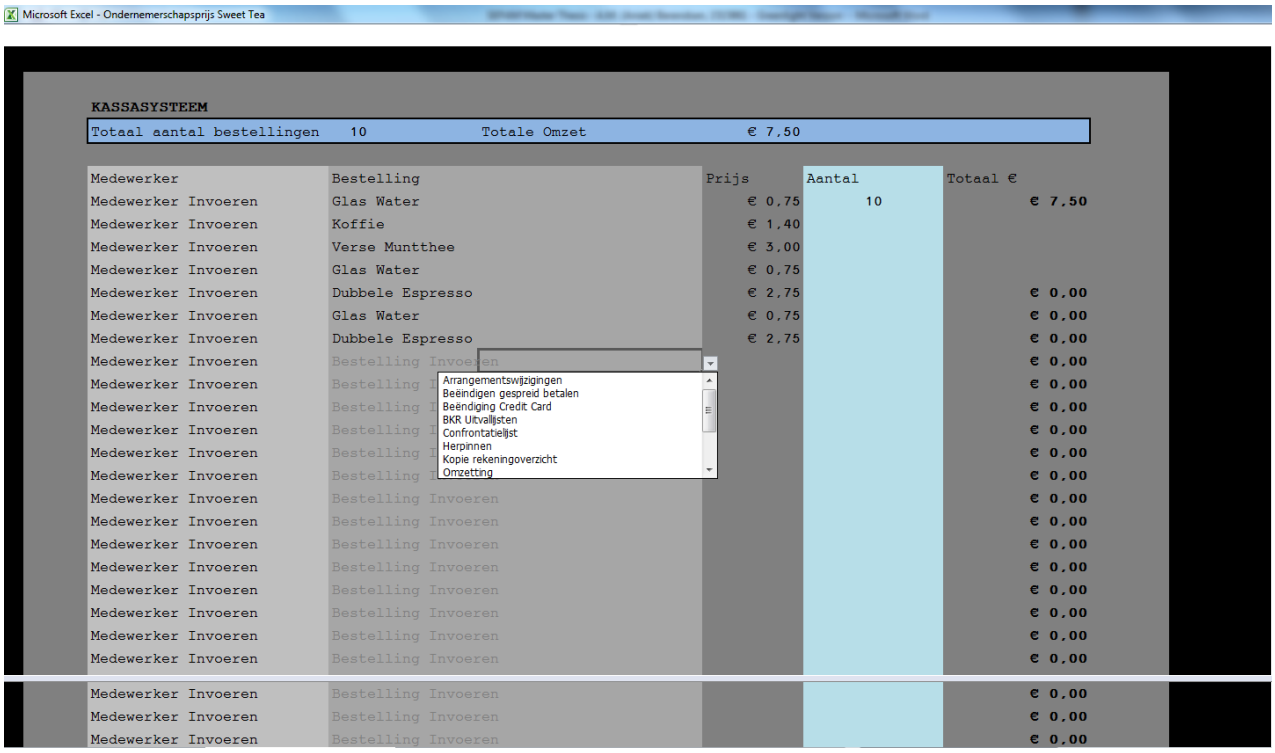
Werkrooster Sweet Tea - Maandag 8 December

		Geplande uren	Werkelijke Begintijd	Werkelijke Eindtijd	Pauze	Uitgebetaalde Werkuren
Boekhouder	(Medewerker 1)	8	7,50	16,50	1,00	8,00
Verkoper	(Medewerker 2)	8	7,50	16,50	1,00	8,00
Serveerster	(Medewerker 3)	8	9,00	17,00	0,50	7,50
Schoonmaakster	(Medewerker 4)	8	9,00	17,00	1,00	7,00
Magazijnmedewerker	(Medewerker 5)	8	8,50	16,00	1,00	6,50
Barista	(Medewerker 6)	8	8,00	14,00	0,25	5,75
Inkoper	(Medewerker 7)	8	10,00	14,00	0,00	4,00
Directeur	(Medewerker 8)	8	11,50	20,00	0,50	8,00

	Planning	Uitbetaald
Totaal werkuren	64,00	54,75
Personeelskosten	€ 1.760,00	€ 1.505,63

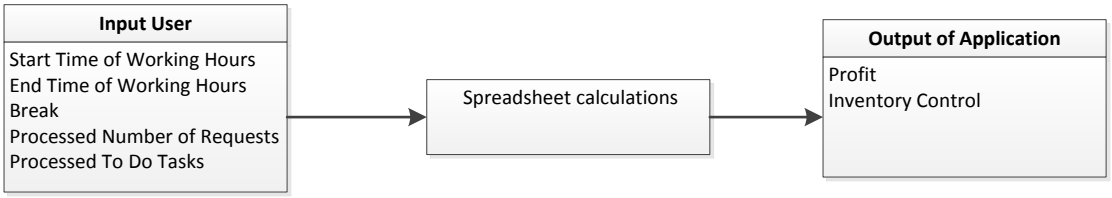
Aftekenlijst Schoonmaken etc.	***Wat***	***Wie***	**Uren schoongemaakt**
Apparaten opstarten	Control D Lijsten	(Medewerker 1)	1,00
Voorraad bijvullen	Overige Productie	(Medewerker 2)	0,50
Gastenboek doornemen	Kwaliteit	(Medewerker 3)	1,50
Roosters maken	Management Ondersteuning	(Medewerker 4)	1,75
Oefenen op Barista Specials	Opleiding	(Medewerker 5)	1,00
Nieuw menu ontwerpen	Projecten	(Medewerker 6)	0,25
Apparaten reinigen	Storing	(Medewerker 7)	1,50
Gastenboek doornemen		(Medewerker 8)	0,75
…			
…			
…			
…			
…			

Control D Lijsten
Overige Productie
Kwaliteit
Management Ondersteuning
Opleiding
Overleg
Projecten
Storing



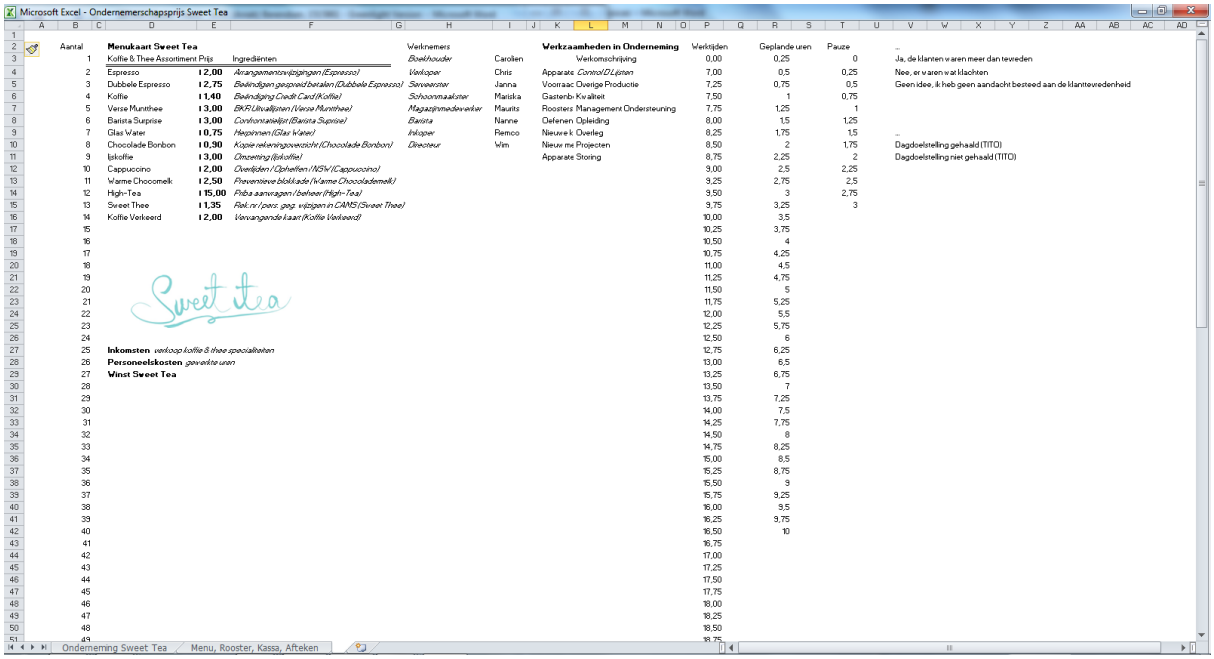
A7.3 Code of Application

For the first prototype of the application, simple spreadsheet calculations are used to translate the input into output performance indicators. Users input the start and end of their working hours, as well as their break. Furthermore, they input their number of processed requests and the processed to do tasks. By means of if statements, the fictitious scores are automatically calculated.



A7.4 Back-end Design

The back-end of the first prototype is a basic Excel spreadsheet from which the required application input data is referenced.



A7.5 Evaluation of First Gamification Design

To evaluate the first gamification design an evaluation session is held with Linda van Veen. Linda is group leader at the Game Lab at the TU Delft. The evaluation session is held in Dutch, as by this language both the game design expert and the researcher could express themselves best. The evaluation session started with an explanation of the researcher of the context, gamified intervention and the design. After walking through the design, some specific issues are discussed. The evaluation session is transcribed and the main tips and tricks are used in the gamification design process.

Evaluatie Sessie Linda van Veen
19 December 15.00uur

Heb je suggesties vanuit jouw ervaring met Serious Games om de samenwerking binnen een team te verbeteren?
Linda: Heb je Team Up gespeeld? Dat werkt wel op een ander vlak, waarbij je elkaar nodig hebt om verder te komen. Misschien kun je dat erin opnemen. Iedereen heeft zijn eigen informatie, je zit in dezelfde wereld. Dus niet dat iedereen voor zich speelt maar of je op een manier een aantal relaties kan leggen. Je zou gewicht kunnen geven aan een aantal dingen, als bepaalde dingen lastiger zijn om te doen. Ik weet niet of dat ook aan een taak kan hangen, dat je zegt deze taken zijn typisch lastiger dan andere taken of dat je binnen een taak de lastigere kwesties hebt of de minder lastigere kwesties. Misschien dat je ook binnen een creditcard aanvraag kan kijken of er verschillende punten aan te hangen zijn, niet elke creditcard aanvraag hoeft even lastig te zijn.

Dat is ook in de praktijk zo, niet elke aanvraag is even snel te verwerken.
Linda: Iemand die heel veel kleine taakjes doet moet evenveel punten krijgen als iemand die misschien een lastigere grote taak oppakt – maar dat wordt misschien wel een complex geheel om alles gelijkmatig uit te balanseren.

In het huidige design is dat gedaan op basis van de norm, zodat ze steeds hetzelfde totaal aantal per uur kunnen verdienen.
Linda: Ah oke, dus eigenlijk moet je helemaal niet naar die prijzen kijken maar dat doen mensen eigenlijk toch wel, automatisch. En je hebt misschien dat mensen automatisch een aantal werkstromen oppakken of mensen die er al langer werken die alles kunnen. In plaats van dat je het nooit doet en altijd overslaat, moet je dan misschien een keer om opleiding gaan vragen – in plaats van te denken dat doet iemand anders wel, als je ook ziet dat iemand het nooit doet. Maar als je weer opgeleid moet worden, dan heb je weer iemand anders nodig – dan wordt het ook wel weer complex. Maar als je iemand hebt opgeleid, dat je daar dan wat voor krijgt, of dat je je hebt laten opleiden dat je dat inzichtelijk maakt of dat je daar punten voor kan krijgen.

Als jullie kijken naar jullie games, hebben jullie dan een bepaald stappenplan wat je dan doorloopt – en hoe ga je testen of iets leuk is en werkt?
*Linda: Ja, dat is altijd lastig. We hebben wel een Game Design Document van Igor – dat proberen we van begin tot eind af te lopen. Maar dan weet je nog niet of het een goed spel is. En dat doe je echt door te testen. En dan heb ik de mazzel dat ik ook heel veel met Igor heb mogen samenwerken, van dit soort dingen werken wel (*Expertise) en dat soort dingen werken minder. Waardoor hij dan zegt nee we moeten het zo doen, waardoor ik het zelf nog wel steeds lastig vind. Die ervaring heb ik ook nog niet, zoals hij dat heeft. Dus ja, dat ervaren we vooral door te testen.*

Dus eigenlijk het leren van de eerste testfase zoals we nu doen?
Ja, daar krijg je vaak veel uit en daar kan je veel uit leren.

Zijn jullie ook wel eens bezig met werkprocessen, dat je wat iemand op het werk doet in een spelvorm zet?
Linda: We hebben wel voor ProRail wat gedaan, waarbij we werkprocessen van mensen bij ProRail hebben gesimuleerd. Voor treindienstleiders die voor een beeldscherm zitten, waarbij voor een top down grafische en hele simpele interface van het treinspoor / treinnetwerk kijken en dan alles in de gaten moeten houden en dan komt er bijvoorbeeld een vierkantje voorbij rijden en dat is dan een trein die daadwerkelijk rijdt, en dan moeten ze bijvoorbeeld in de gaten houden dat soms moet er een brug open voor de scheepvaart, en dat dan afstemmen – zo houden ze dan alles in de gaten. Dus dat hebben we heel specifiek gebouwd, maar dat was ook wel om die mensen te trainen. Dus meer een sessie, niet iets waarmee ze in hun dagelijks werk mee aan de slag gaan. Dat is meer gamification en dat hebben we zelf eigenlijk nooit gedaan. Dat is natuurlijk wel het doel hiervan, dat ze het naast hun normale werk blijven doen. Maar wat je zegt over die onderlinge competitie die ontstond, wat vonden ze daar precies vervelend aan. Was dat een soort van afgunst, van jij hebt minder gedaan?

De score gaat op team basis, maar ze vinden het toch vervelend als ze zien dat hun individuele score lager is dan die van iemand anders. Als ze zeggen van ik heb heel goed werk verzet, maar toch zie ik dat niet terug. En

dat is wel lastig, want sommige mensen willen een hele hoge score terwijl anderen meer voldoening halen uit het verwerken van een heel lastig verzoek.
Linda: Maar je kan dus ook niet inzichtelijk maken wat iedereen heeft gedaan maar dat je gewoon de totaalscore laat zien. En dat je dan misschien wel ziet wát er allemaal gedaan is, zoveel kopjes koffie van dit en dat in totaal maar niet uitgesplitst.

Maar je moet er wel voor zorgen dat mensen wel invullen wat ze echt gedaan hebben?
Maar dat zou je kunnen vergelijken met hun eigen systeem, wat ze ook al bijhouden – check of alles correct wordt bijgehouden en indicatie als dat niet zo is.

Maar de transparantie kan ook gevolgen hebben. Het is wel goed dat het transparant is, maar dat kunnen ook hele lastige onderwerpen zijn.
Het kan ook nu onwennig zijn, maar dat het ook wel goed is als het transparant wordt en conflicten kunnen daarna weer tot verbeterding leiden.

Uitleg Motivational Affordances. Kan jij met jouw ervaring iets over deze 4 motivational affordances zeggen, is dit compleet en heb je ervaring met het gebruik hiervan?
Linda: Dit gaat meer echt in op gamification. Bij IO zit ook een clubje die op Gamification zitten. De trekker van die club is Valentijn Visch. Ik kan jullie wel in contact brengen met elkaar. De rest van de club ken ik niet. Zij noemen het trouwens wel meer persuasive gaming. Maar competitie is wel weer een echt game element wat wij veel gebruiken, maar je moet goed kijken hoe je het hier wilt bereiken. Ook als prijs kan je zeggen dat je een bepaalde drempelwaarde moet halen, dat je dan als groep dat kan bereiken. En dat je bijvoorbeeld dagelijks iets kan verzamelen als je de drempelwaarde hebt gehaald. En dat je dat dan binnen een maand ofzo kan halen. Een tijdsdruk is ook altijd goed in games – van je hebt zoveel tijd om dit te doen. De games die wij maken, daarbij probeer je processen wel na te bootsen maar je haalt mensen uit hun omgeving en dat is dan echt een aparte omgeving waar ze in spelen, maar dit is gewoon in de omgeving zelf. Als de teams gewoon teams zijn die bij elkaar zijn gezet en dan ineens als team moet fungeren, dan kan door in de metafoor alles meer bespreekbaar worden. Dat ze veel meer de communicatie met elkaar aangaan, en dat ook weer terugkoppelen op het werk van omdat je dit altijd goed doet mag je dit ook in het werk gaan doen.

Het idee is dat het systeem gelinkt is aan hun eigen systemen, zodat het op echte data is gebaseerd en niet op hun eigen inschatting.
Dat lijkt me erg leuk. Je krijgt ook wel een andere dynamiek als je het steeds ziet veranderen en steeds een update ziet. in plaats van aan het einde van de dag. En als je dan al heel veel gedaan hebt die dag, dan kan je dan eens andere dingen doen zoals opleiding enzo – maar dan moet je wel een overzicht hebben van wat er die dag gedaan is. Je zou het op langer termijn ook kijken of je het intern kan updaten, linken aan hun eigen systeem. Dus idealiter zou je het willen uitladen in het ene bestand naar een ander.

A8. Second Gamification Design

After the gamified intervention with the first gamification design, the design is evaluated and ideation for design changes is done. With these insights, a second gamification design is developed. Therefore the five steps of the gamification design process by Deterding are walked through again and revised were relevant and necessary. Accordingly, the second gamification design is developed and validated. Therefore use is made of design lenses to create the four motivational affordances of compete, challenge, empathize and explore. This appendix presents the design lenses and second gamification design by its front-end design, screens,

A8.1 Design Lenses

The following design lenses for game design are selected for the gamification design in this research. The design lenses are adapted from Schell (2008). As mentioned in paragraph 2.1.6., the skill atoms can be used for the analysis and lenses are selected to support the design for competition, challenge, empathize and explore. For competition, lens number 36 for competition, lens 37 for cooperation and lens number 38 for competition and cooperation is used. For challenge, lens number 31is applied, followed by lens number 65 for the story telling in order to empathize. Lastly, the lenses number 4 for curiosity, number 2 for surpise and number 6 for problem solving are used for exploration (Schell, 2008). This Appendix gives an overview of the design lenses of Schell (2008), which are adapted for gamification design.

A8.1 Design Lenses to Skill Atoms

For the skill atoms lens, the focus is on the skills that are being asked of the users. The designer should ask himself the following questions:

- What skills does the gamification design require from the user?
- Are there categories of skill that the gamification design is missing?
- Which skills are dominant?
- Are these skills creating the desired experience?
- Are some users much better at these skills than others? Does this make the gamification design feel unfair?
- Can users improve their skills with practice?
- Does this gamification design demand the right level of skill?

A8.2 Design Lenses to Compete

Schell (2008) argues that it is a basic human urge to determine who is most skilled at something. A gamification design of competition can satisfy that urge. The designer should ask himself the following questions, to be sure the competitive gamification design makes people want to win it.

- Does the gamification design give a fair measurement of users skill?
- Do people want to win my in gamification design? Why?
- Is winning in this gamification design something people can be proud of? Why?
- Can novices meaningfully compete at the gamification design?
- Can experts meaningfully compete at the gamification design?
- Can experts generally be sure they will defeat novices?

Balancing competition and cooperation can be done in many ways. Althoug competition is created, self-managing teams should cooperate as a team in order to compete against other teams. Competition within a self-managing team is not in line with the objectives of a self-managing team and is therefore mitigated in the design. To balance competition and cooperation properly in the gamification design, the designer should ask himself the following questions.

- If "1" is Competition and "10 " is Cooperation, what number should the gamification design get?
- Can I give user a choice whether to play cooperatively or competitively?
- Does the users prefer competition, cooperation, or a mix?
- Is team competition something that makes sense for the gamification design? Is the gamification design more fun with team competition, or with solo competition?

To ensure a team is collaborating and succeeding as a team, the following questions can be used to study the cooperative aspects of the gamification design.

- Cooperation requires communication. Do the user have enough opportunity to communicate? How could communication be enhanced?
- Are the users friends already, or are they strangers? If they are strangers, can it help them break the ice?
- Is there synergy (2+2 = 5) or antergy (2+2 = 3) when the users work together? Why?
- Do all the users have the same role, or do they have special jobs?
- Cooperation is greatly enhanced when there is no way an individual can do a task alone. Does the gamification design have tasks like that?
- Tasks that force communication inspire cooperation. Do any of the tasks force communication?

A8.3 Design Lenses to Challenge

Schell (2008) states that challenge is at the core of almost all gameplay and that you can even say that a game is defined by its goals and its challenges. When examining the challenges in the gamification design, the designer should ask himself the following questions:

- What are the challenges in the gamification design?
- Are they too easy, too hard, or just right?
- Can the challenges accommodate a wide variety of skill levels?
- How does the level of challenge increase as the user succeeds?
- Is there enough variety in the challenges?
- What is the maximum level of challenge in the gamification design?

A8.4 Design Lenses to Empathize

According to Schell (2008) a story is strong way to engage people in the gamification design and in order to create a good so-called story machine, the designer should ask himself these questions:

- When user have different choices about how to achieve goals, new and different stories can arise. How can more of these choices be added?
- Different conflicts lead to different stories. How can types of conflict arise from the gamification design?
- When user can personalize the characters and setting, they will care more about story outcomes, and similar stories can start to feel very different.
- How can the users personalize the story?
- Good stories have good interest curves. Do the rules lead to stories with good interest curves?
- A story is only good if you can tell it. Who can your users tell the story to that will actually care?

A8.5 Design Lenses to Explore

In order to support the exploration in the gamification design, the lens of curiosity, surprise and problem solving is used. Schell (2008) stresses that to create curiosity, the designer should think of the user's true motivations and not just the target outcomes the gamification design sets but the reason the user wants to achieve those goals. Therefore, the following questions should be asked:

- What questions does the gamification design put into the user's mind?
- What can be done to make them care about these questions?
- What can be done to make them invent even more questions?

Schell proposes an example of a maze-finding videogame with a time-limit goal and interesting animations to become visible when they solve each maze. But next to curiosity, a surprise can be an intrinsic basic element for to support further exploration. According to Schell, surprise is a crucial part of all entertainment, fun, strategy and problem solving (2008). In order to include surprises in the gamification design, the following questions can be asked.

- What will surprise the users in the gamification design?
- Does the story in the gamification design have surprises?
- Do your rules, artwork or technology give users ways to surprise each other?
- Do your rules, artwork or technology give users ways to surprise themselves?

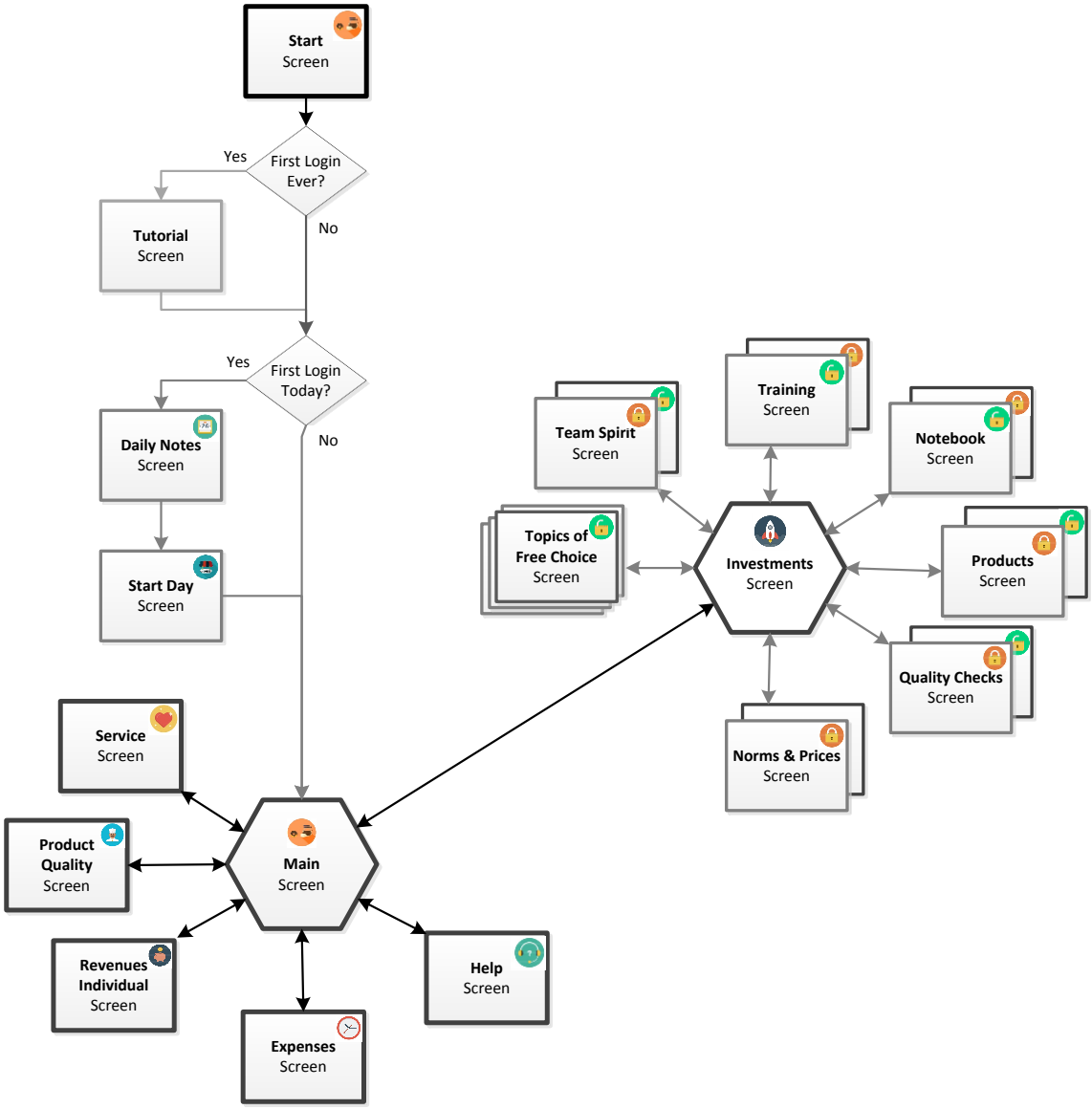
Lastly, the lens of problem solving is useful. Therefore, the following questions should be asked while thinking of the problems the users must solve to succeed in the gamification design:

- What problems does the gamification design ask the user to solve?
- Are there hidden problems to solve that arise as part of gameplay?
- How can the gamification design generate new problems so that users keep coming back?

A8.2 Front-End Design

The front-end design provides an overview of all screens that are included in the gamification design. If the user opens the application, always the start screen is shown. The Excel Application has an username for each user and this username is used to recognize whether or not the user opens the gamified application for the first time ever or the first time today. Based on this registered information, either a tutorial or a daily update is shown. If the user has opened the application earlier that day, he is directly guided to the main screen. From the main screen the user that choose himself which screen to open, for instance the expenses screen to adapt his working hours or the revenues screen to adapt his processed number of customer requests. From the main screen the user can also go to the investments screen, by which several other screens can be opened.

The screens are based on the work activities of the self-managing teams. For example the training screen is developed as follows. For each workflow, a self-managing team member can have five different levels of skilfulness. For level zero the skill is absent, for level one, the employee has had instructions on how to conduct the workflow. At level two, the employee may be able to handle the workflow, if an experienced colleague is in the neighbourhood for questions. At one level higher, the employee can handle the workflow independently within the set time for handling the customer request. Lastly, the fourth level is achieved if the employee can train and coach others for the specific workflow. The self-managing team needs to manage these trainings over time, in order to maintain or increase the level of skillfulness within their team while processing all inflow of customer requests according to the customer focused and TITO principles. The all-round skillfullness of the self-managing teams has influence on their flexibility. Therefore an overview is created of the skillfulness per self-managing team employee per workflow.



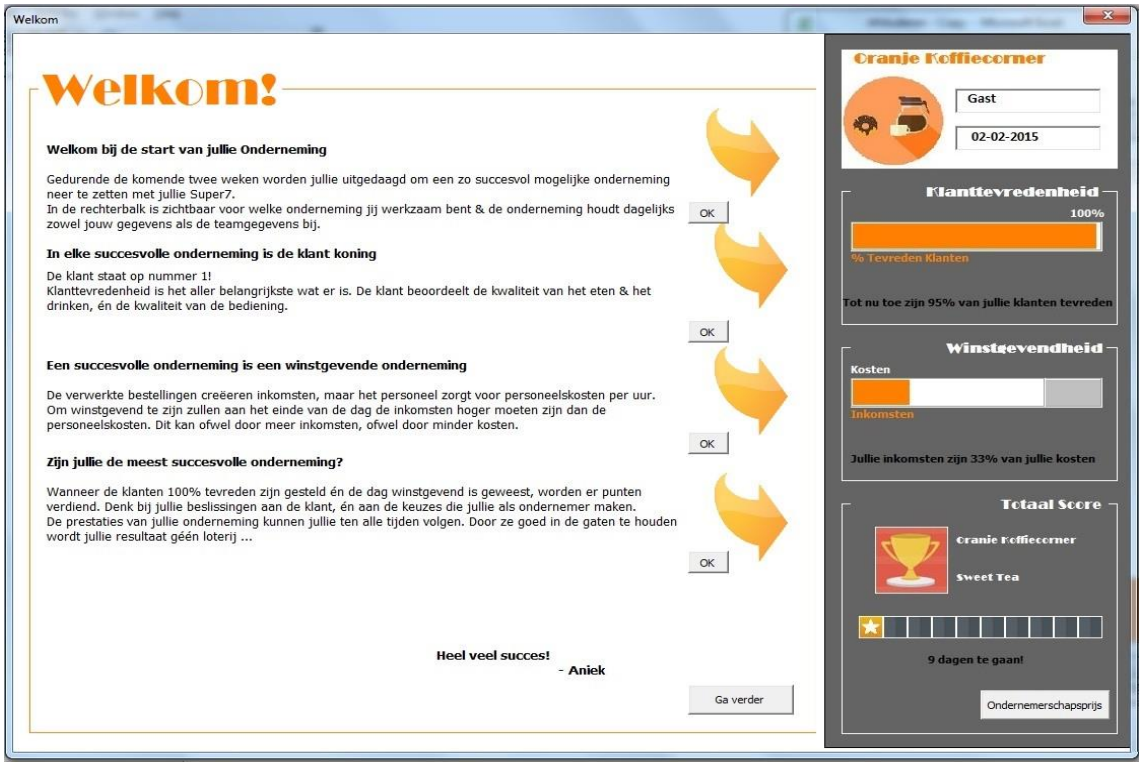
A8.2 Screens of Application

The previous paragraph of the application gives an overview of all screen included. Each screen is shown in this appendix whereas more information about the screens is given in the main body of this report.

Start Screen



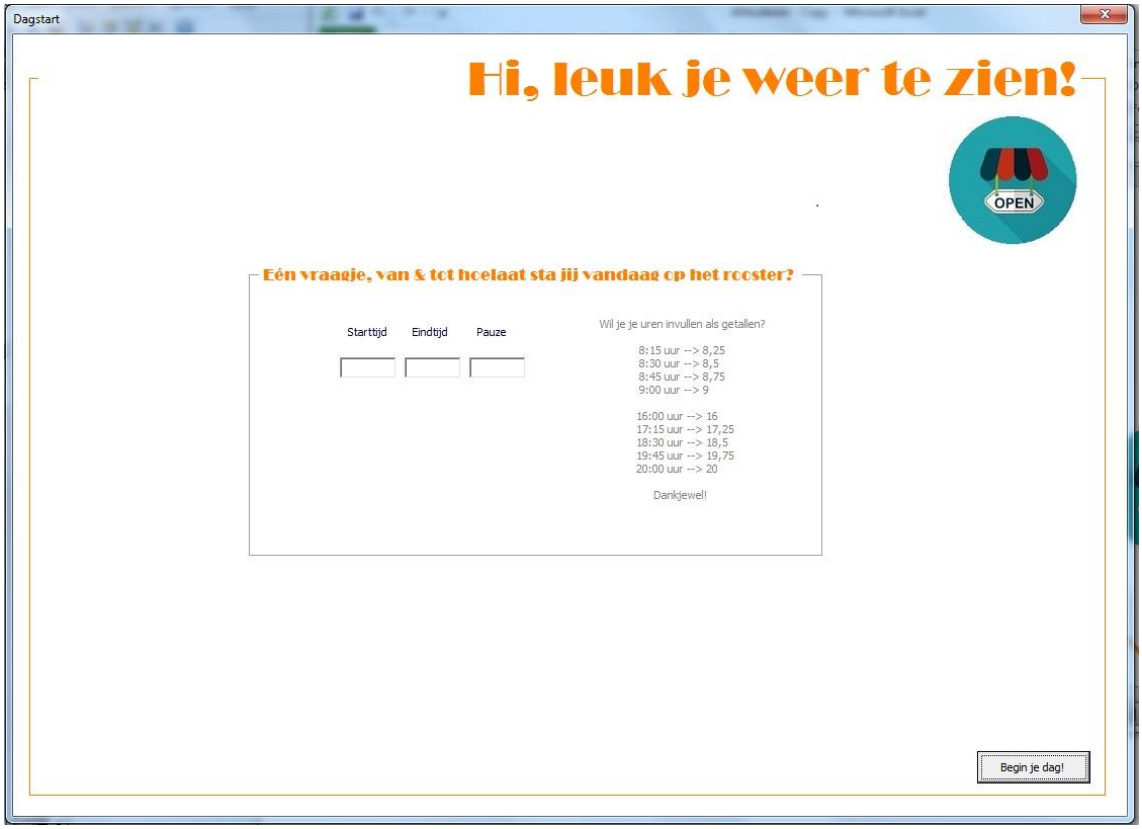
Tutorial Screen



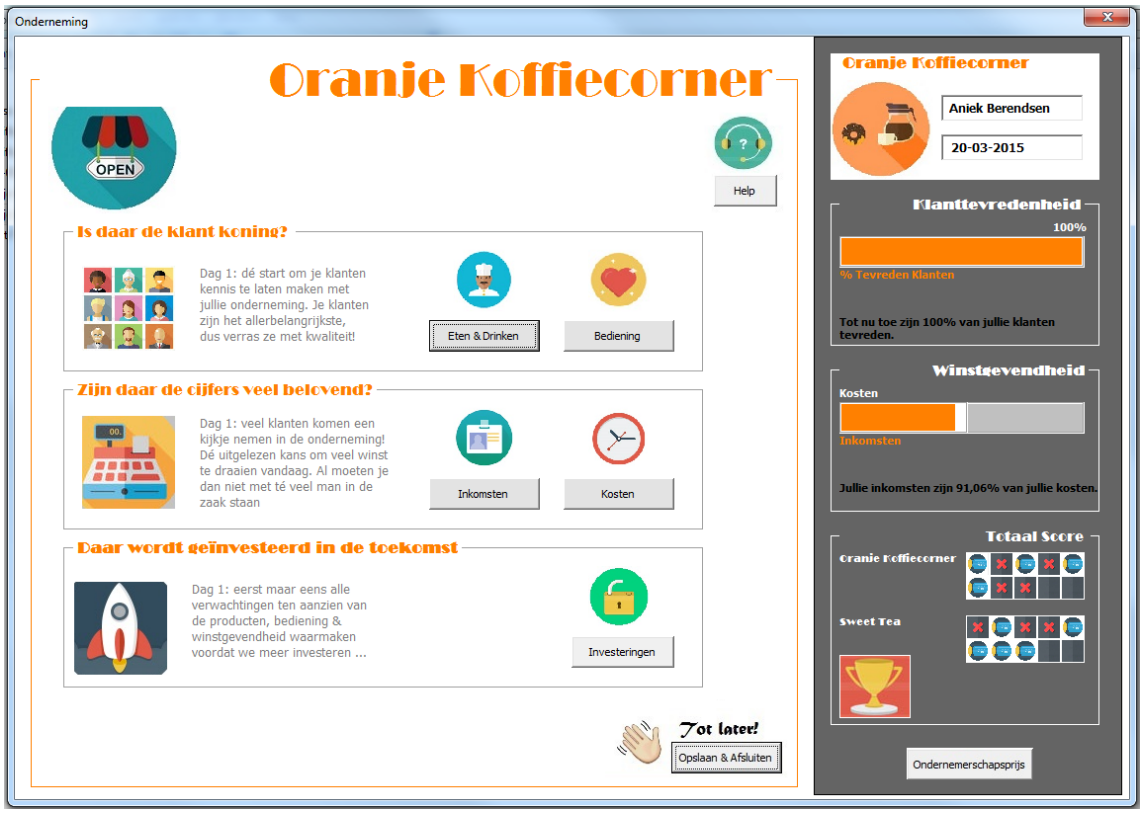
Daily Notes Screen



Start of the Day Screen



Main Screen



Service Screen



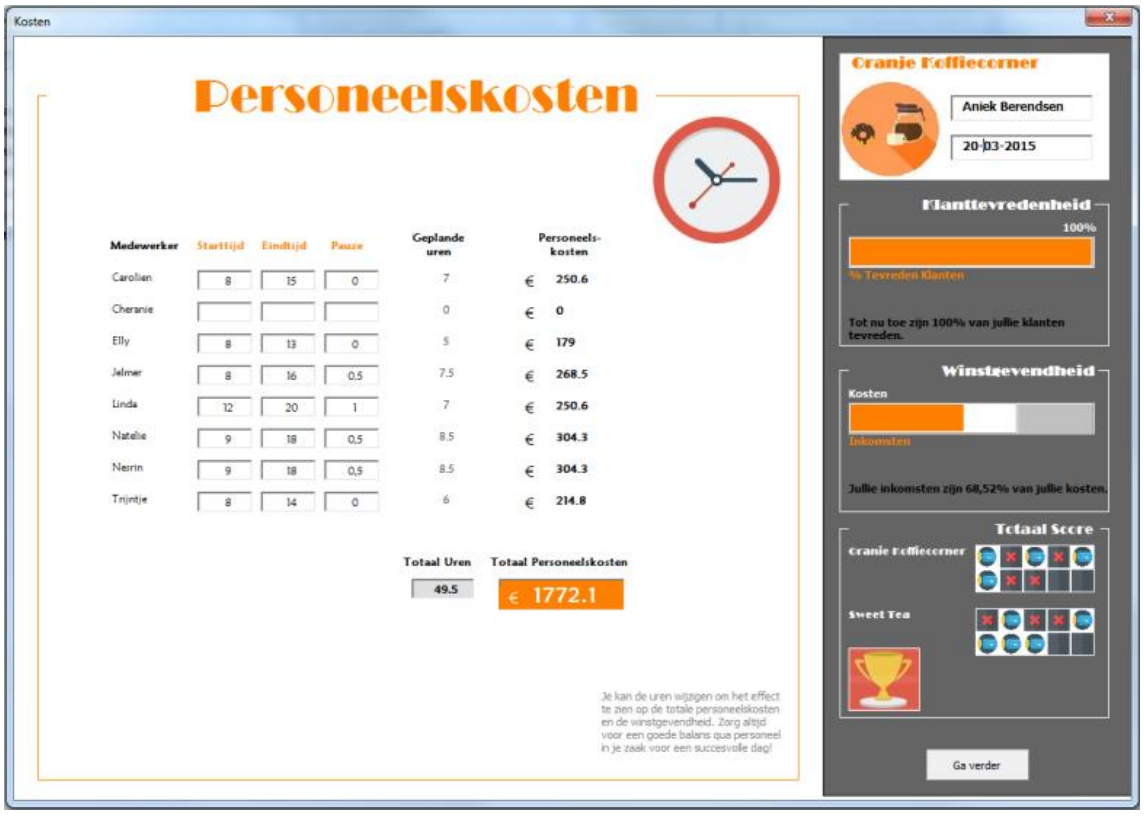
Product Quality Screen



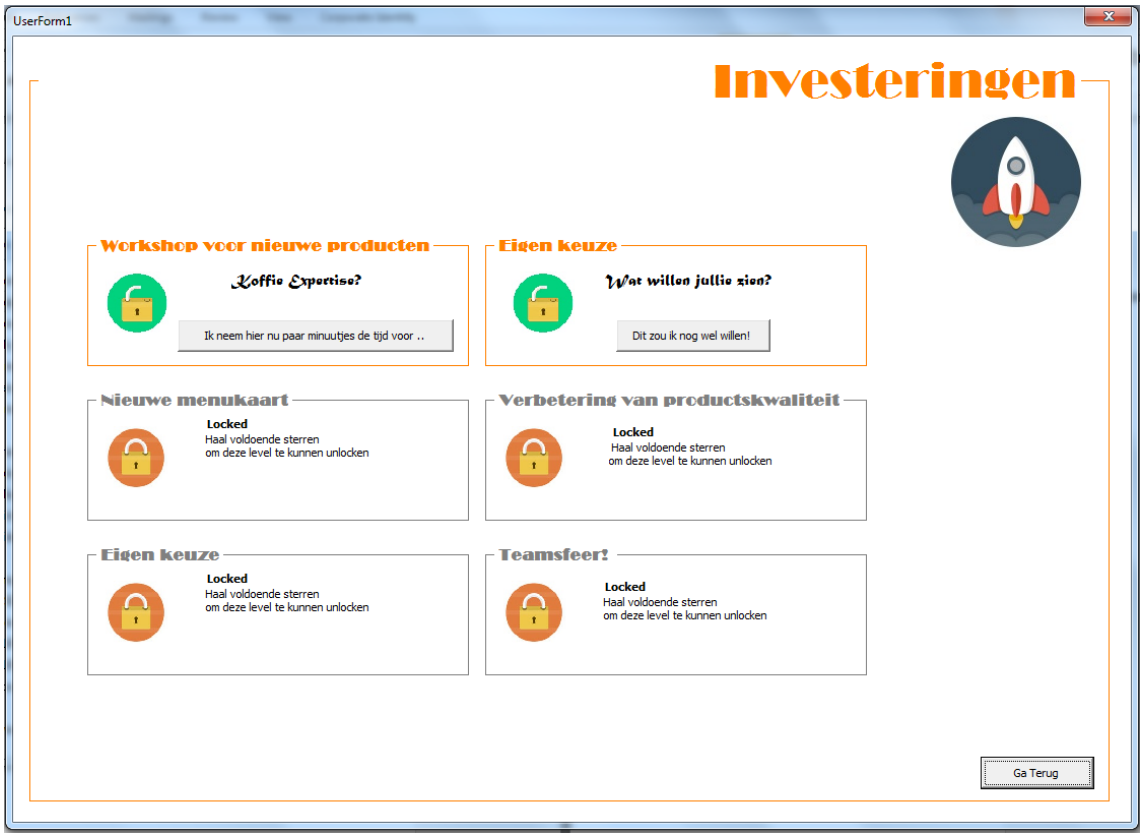
Revenues Screen



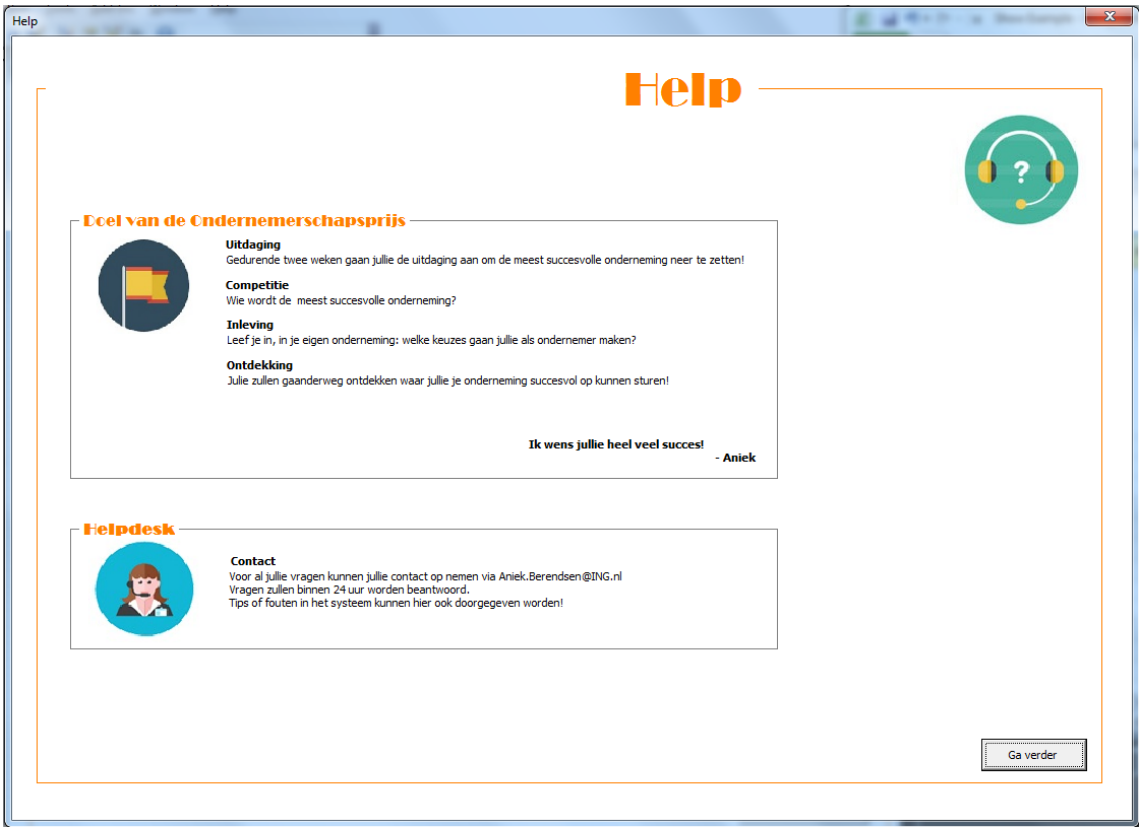
Expenses Screen



Investments Screen



Help Screen



Training Screen



Notebook Screen



Company Main Screens

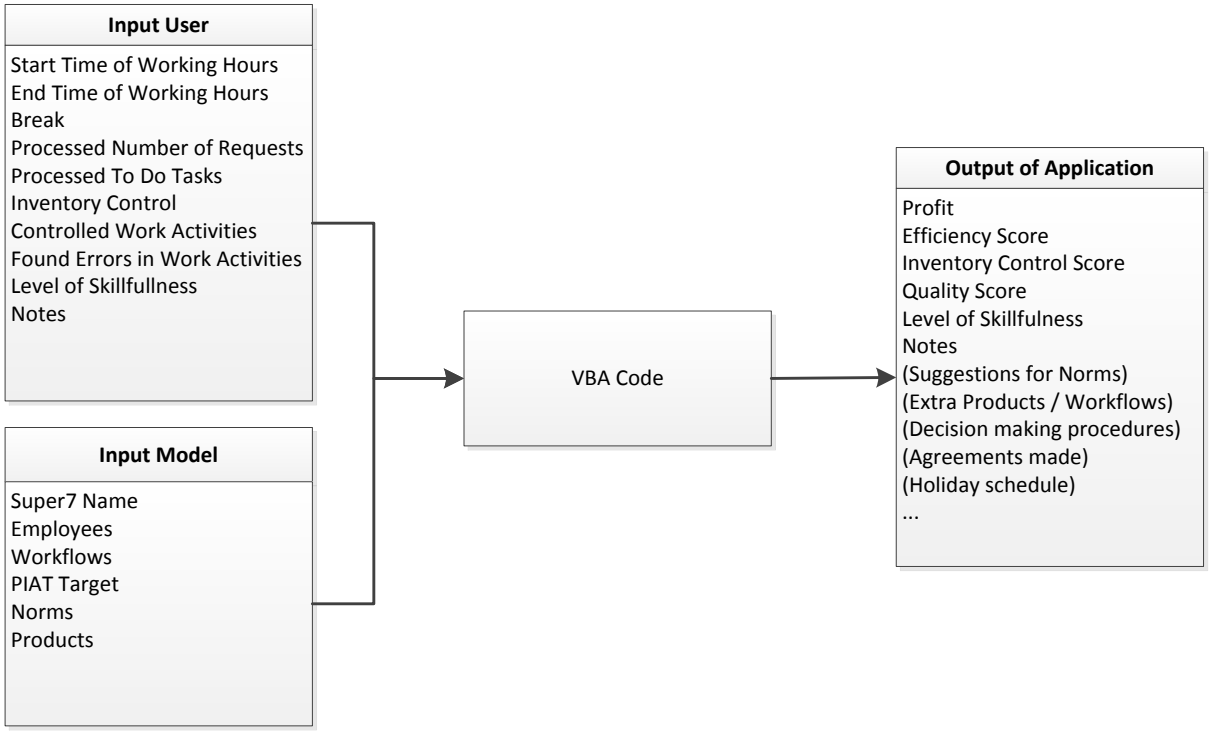
To make the application applicable for each self-managing teams, a few screens are specifically designed for each self-managing team. As each self-managing team has chosen their own company, the following screens are made company specific: the main screen, product quality screen, revenues screen, expenses screen and training screen. An example of another company is Sweet Tea, of which the adapted main screen is shown.





A8.4 Code of Application

This appendix shows the key parts of the code used in the application. The researcher of this thesis can be contacted to get the complete code, as it is too extensive to include in this report. As a basis for programming, the input and outputs are defined. The input can either be in the model, which might be different for each self-managing team, or it may also differ per individual user. The output of the application is always team data, although individuals scores are also visible next to the team output on the specific screens.



Code used for each Screen

Hide Excel Spreadsheet and Show Application

To show the application, it is nice to hide the Excel spreadsheet while the Application is running. If you do not hide the spreadsheet, users will constantly see their data being stored and updated in the back end. Therefore, the following code is used to hide the application at the start. It is important to not forget to set the visibility back on true, otherwise users are not able to reach their other workbooks open in Excel.

```
Application.Visible = False
Application.Visible = True
```

Show User forms

To start the application up, the first screen is to be showed. For the application, each version has its own start screen which is linked to the other specific version screens. Therefore, only the number of the start screen has to be changed in order to load the desired version of the application.

```
UserForm0StartScreen1.Show
UserForm0StartScreen2.Show
```

Display Data in User form

After a user form is showed, the values can be loaded from the data file in the back end. There are two function to do this. The initialize function will only set the values the first time, the activate function will update the values every time the userform is called. Depending on this need, both functions are used in the application to display the initial or saved data

```
Private Sub UserForm_Activate()
Private Sub UserForm_Initialize()
```

Recognize the User

Each user has its own username defined in Excel. This username is used to identify the user and to load and save the specific user data.

```
Username.Application
```

If the username is not known, the username is saved. Accordingly it is checked which employee is using the application by the following code.

```
'Check which employee if using the application
   If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Or
    Application.UserName = ThisWorkbook.Sheets("User").Range("B6").Value Then
   'An array is specified in which the Application Username may be saved,
    the code checks for all values in this array if the username is equal

      'Employee 1?
       If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
          Then
          'Specify what needs to change or saved
       End If
   End If
```

Move to Next Screen

Command buttons are used to move to the next screen. For each connection, the name of the user form must be adjusted to define the screen to show. In the first section of this Appendix (A.1) the links between the screens used in this application are shown. The function 'unload me' is used to unload the screen and move to the next one. Another option is to use a hide function, which might be used if information on the screens does not have be updated. In the application, only the first code is used.

```
Private Sub CommandButtonGaVerder_Click()
'Go to Next Screen
    Unload Me
    UserForm0StartDay.Show
End Sub

Private Sub CommandButtonGaVerder_Click()
'Go to Next Screen
    UserForm0StartDay.Hide
    UserForm1MainScreen1.Show
End Sub
```

Disable Exit Button

In order to disable users to click on the exit button, this code is applied in each user form. By disabling the exit button, the number of savings can be limited which increases the speed of the application. In addition, by forcing the user to exit the application via a specific button, the precise saving process can be defined.

```
Private Sub Userform_QueryClose(Cancel As Integer, CloseMode As Integer)
'Disable Close by Button
   If CloseMode = 1 Then
   'Do not Close the Form
   Else
      MsgBox "Je kan de Onderneming alleen via de uitgang verlaten." & vbNewLine
      & "" & vbNewLine & "(De uitgang is te vinden op de overzichtspagina van de
      Onderneming, loop dus nog iets verder ..)"
   Cancel = True
   End If
End Sub
```

Save Data in a Different Workbook

This code opens a different workbook, without alerts and invisible if the application invisibility is used. For each user, a different file is automatically saved by using the users first name in the data file name by a function called 'Voornaam'. This piece of code is used around the changes that needs to be saved in a different workbook. It is important to not forget to define the correct the file format, which for instance can be a macro enabled or a normal workbook.

```
Private Sub Workbook_Open()
 'Save Data in other Workbook
    'Open right workbook
        Dim objWorkbook As Workbook
    Set objWorkbook =
    Workbooks.Open(Filename:="\\europe.intranet\DFSNL\P\UD\002046\VC72HG\Desktop\
    Map2.xlsx")

    'Determine what needs to be saved and where to save it to
    ActiveWorkbook.Sheets("TeamData").Range("A5").Value = "Aniek is a Winner!"
    ActiveWorkbook.ActiveSheet.Range("A1") = "DefaultFileFormat"

    'Save and Close the workbook
        Application.DisplayAlerts = False
    ActiveWorkbook.SaveAs
    Filename:="\\europe.intranet\DFSNL\P\UD\002046\VC72HG\Desktop\Ondernemerschap
    P3\" & DateToday & " " & "Sweet Tea" & " - " & Voornaam & ".xlsm",
    FileFormat:=xlOpenXMLWorkbookMacroEnabled
End Sub
```

Show Leaderboard

On many screens, a leaderboard is shown. This leaderboard immediately displays the changes in for instance working hours or production, on the key indicators of profit and customer satisfaction. To display the correct data, this code is used to show the team results of eight employees.

```
'Display Name of User
Dim Voornaam As String

'Check which Employee is using the Application
If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("B6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("C6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("D6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("E6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("F6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("G6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("H6").Value Then

'Employee 1?
   If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
   Then
   Voornaam = ThisWorkbook.Sheets("User").Range("A4").Value
   End If

'Employee 2?
   If Application.UserName = ThisWorkbook.Sheets("User").Range("B6").Value
   Then
   Voornaam = ThisWorkbook.Sheets("User").Range("B4").Value
   End If

'Employee 3?
   If Application.UserName = ThisWorkbook.Sheets("User").Range("C6").Value
   Then
   Voornaam = ThisWorkbook.Sheets("User").Range("C4").Value
   End If

'Employee 4?
    If Application.UserName = ThisWorkbook.Sheets("User").Range("D6").Value
    Then
```

```
        Voornaam = ThisWorkbook.Sheets("User").Range("D4").Value
        End If

    'Employee 5?
        If Application.UserName = ThisWorkbook.Sheets("User").Range("E6").Value
        Then
        Voornaam = ThisWorkbook.Sheets("User").Range("E4").Value
        End If

    'Employee 6?
        If Application.UserName = ThisWorkbook.Sheets("User").Range("F6").Value
        Then
        Voornaam = ThisWorkbook.Sheets("User").Range("F4").Value
        End If

    'Employee 7?
        If Application.UserName = ThisWorkbook.Sheets("User").Range("G6").Value
        Then
        Voornaam = ThisWorkbook.Sheets("User").Range("G4").Value
        End If

    'Employee 8?
        If Application.UserName = ThisWorkbook.Sheets("User").Range("H6").Value
        Then
        Voornaam = ThisWorkbook.Sheets("User").Range("H4").Value
        End If

     Else
        No employee from this self-managing team?
        Voornaam = ThisWorkbook.Sheets("User").Range("AF4").Value

End If
      TextBoxNaam.Value = Voornaam

    'Fill in the Date
        Dim DateToday As String
        DateToday = Format(Now(), "DD-MM-YYYY")
        TextBoxDatum.Value = DateToday

    'Fill in Employee Satisfaction
        Dim Kwaliteit As Currency
        Kwaliteit = ThisWorkbook.Sheets("User").Range("J107").Value
        Progressbar.TextKlant.Caption = "Tot nu toe zijn " & Kwaliteit & "% van
        jullie klanten tevreden."
        Progressbar.TevredenKlanten.Width = Kwaliteit / 100 * 182

    'Fill in Profit
        Dim Inkomsten As Double
        Dim Kosten As Double
        Dim Winst As Currency

        Inkomsten = ThisWorkbook.Sheets("User").Range("J33").Value
        Kosten = ThisWorkbook.Sheets("User").Range("J11").Value
        Winst = (Inkomsten / (Kosten + 0.000001))

        Progressbar.Text.Caption = "Jullie inkomsten zijn " & Winst * 100 & "%
        van jullie kosten."
        Progressbar.Inkomsten.Width = Inkomsten /
        ThisWorkbook.Sheets("User").Range("J14").Value * 182
        Progressbar.Kosten.Width = Kosten /
        ThisWorkbook.Sheets("User").Range("J14").Value * 182 + 3
```

Screen Specific Code

Start Screen

Once the user starts Excel and enables the macro's, the Start Screen of the application opens up and hides the Excel spreadsheet. For each enterprise, a different version of the start screen was created. Therefore, the

workbook open function determines which enterprise to show. It is not in the displayed code, but the code for checking which employee is using the application is added to this code, to determine when the specific employee logged in. This code namely checks if the user opens the application for the first time, for the first time today or if they already opened it today to guide them to the right screen.

```
Private Sub Workbook_Open()
    'Hide Excel Sheet
       Application.Visible = False

    'Start Application
        UserForm0StartScreen1.Show
    End Sub

    Private Sub CommandButtonGaVerder_Click()
    'Go to Next Screen
        Unload Me

    'Employee 1?
    If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
         Then
    'First Login Ever?
        If ThisWorkbook.Sheets("User").Range("A7").Value = "" Then
            Unload Me
            UserForm0Tutorial.Show
           ThisWorkbook.Sheets("User").Range("A7").Value = Username.Application
        End If

    'First Login Today?
        If ThisWorkbook.Sheets("User").Range("A7").Value <> "" Then
            Unload Me
            UserForm0TutorialDay1.Show
        Else
            Unload Me
            UserForm1MainScreen.Show
        End If
    End If
    End Sub
```

Daily Notes Screen

The Daily Notes Screen is only shown the first time of the day a user starts up the application. Each employee can leave a note for his or her colleagues to read the next day. Furthermore, the team manager and the designer can leave notes for the team to read at the start of their day.

```
Private Sub UserForm_Activate()
LabelOpmerking1.Caption = ThisWorkbook.Sheets("User").Range("A134").Value
LabelOpmerking2.Caption = ThisWorkbook.Sheets("User").Range("B134").Value
End Sub
```

Start Day Screen

The Start Day Screen is also only shown the first time of the day a user starts up the application. Users indicate the planned start and end of their working times and the break they are planned to take. Based on the user's input, the planned personnel costs are calculated in the workbook sheets. The planned number of working hours is multiplied with the hourly wage. For this screen, also the code to check which user it is, is applicable.

```
Private Sub TextBoxStarttijd_Change()
'Save Starttime Changes
    ThisWorkbook.Sheets("User").Range("A7").Value = TextBoxStarttijd.Value
End Sub

Private Sub TextBoxEindtijd_Change()
'Save Endtime Changes
    ThisWorkbook.Sheets("User").Range("A8").Value = TextBoxEindtijd.Value
End Sub
```

```
Private Sub TextBoxPauze_Change()
'Save Break Changes
    ThisWorkbook.Sheets("User").Range("A9").Value = TextBoxPauze.Value
End Sub
```

Furthermore a check is built in, to make sure the employees did fill in a start, end and break time. If they didn't fill in all three input fields, they cannot go to the next screen and a message pops up which asks them to fill in a start, end and break time.

```
Private Sub CommandButtonGaVerder_Click()
'Check which employee is using the Application
If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Or
   Application.UserName = ThisWorkbook.Sheets("User").Range("B6").Value Then

'Check if all three boxes are filled in
    If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
       And ThisWorkbook.Sheets("User").Range("A9").Value = "" Then
          MsgBox "Zou je zowel een starttijd, eindtijd als pauzeduur willen
          invullen?" & vbNewLine & "" & vbNewLine & "Dankjewel!"
    End If

    If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
        And ThisWorkbook.Sheets("User").Range("A9").Value <> "" Then
          Unload Me
          UserForm1MainScreen.Show
    End If
End If
End Sub
```

Main Screen

The main screen displays the leaderboard and links the other input screens with each other.

Service Screen Product

In the service screen, the employee can define whether or not they managed their inventory according to the TITO principle. Their input is processed immediately in the customer satisfaction progress bar. This code is user specific.

```
'Employee 1?
If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
Then
    If CheckBoxWelTito.Value = True Then
        ThisWorkbook.Sheets("User").Range("A57").Value = 1
        Dag5OranjeKoffiecornerBasis.Visible = False
        Dag5OranjeKoffiecornerFaal.Visible = False
    End If
    If CheckBoxWelTito.Value = False Then
        ThisWorkbook.Sheets("User").Range("A57").Value = 0
        Dag5OranjeKoffiecornerBasis.Visible = True
    End If
End If

'Klanttevredenheid invullen
    Dim Kwaliteit As Currency
    Kwaliteit = ThisWorkbook.Sheets("User").Range("J107").Value
    Progressbar.TextKlant.Caption = "Tot nu toe zijn " & Kwaliteit & "%
    van jullie klanten tevreden."
    Progressbar.TevredenKlanten.Width = Kwaliteit / 100 * 182
```

Quality Screen

For the quality screen, many data has to be loaded like the prices, workflows, corresponding products, number of controls per workflows and found errors per workflow. Accordingly, for each changed number of controls of errors, the code specifies what to do. Furthermore, these actions are individual actions and therefore documented per self-managing team member. A small sample piece of code used in this screen to show how the change in one controlled workflow for one employee looks like is as follows.

```
Private Sub TextBoxAantalControleWerkstroom1_Change()
'Check which employee is using the Application
If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("B6").Value Then

    'Medewerker 1?
    If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
    Then
    ThisWorkbook.Sheets("User").Range("A59").Value = TextBoxAantalWerkstroom1
    TextBoxAantalWerkstroomTotaalAantal.Value =
    ThisWorkbook.Sheets("User").Range("J81").Value
    End If
End If

    Dim Kwaliteit As Currency
    Kwaliteit = ThisWorkbook.Sheets("User").Range("J107").Value
    Progressbar.TextKlant.Caption = "Tot nu toe zijn " & Kwaliteit & "% van
    jullie klanten tevreden."
    Progressbar.TevredenKlanten.Width = Kwaliteit / 100 * 182

End Sub
```

Revenues Screen

The Revenues Screen works similar to the Quality Control screen. Despite the following piece of code, which is used to display both the individual and team total scores.

```
'Revenues
Private Sub TextBoxAantalAfrekenen1_Change()
'Check which employee is using the application
If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Or
Application.UserName = ThisWorkbook.Sheets("User").Range("B6").Value Then

    'Employee 1?
    If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value
    Then
    ThisWorkbook.Sheets("User").Range("A15").Value = TextBoxAantalWerkstroom1
    TextBoxAantalWerkstroomAfrekenen1 =
    ThisWorkbook.Sheets("User").Range("AP15").Value
    TextBoxTotaalIndividueel.Value =
    ThisWorkbook.Sheets("User").Range("A32").Value
    TextBoxAfrekenenIndividueel.Value =
    ThisWorkbook.Sheets("User").Range("A33").Value
    End If
End If
End Sub
```

Cleaning Screen

The Cleaning Screen Screen works in a similar way as the Quality Control Screen.

Expenses Screen

The Expenses Screen works in a similar way as the Revenues Screen, despite two important changes. Users are not allowed to change the total number of paid hours and the total number of the team. If they are trying to change it, the original value will return after their change and a message is displayed which tells them not to change the total number of (paid) hours.

```
'Disable Change of Personel Hours or Costs
Private Sub TextBoxUitbetaaldeUren1_AfterUpdate()
    TextBoxUitbetaaldeUren1.Value =
    ThisWorkbook.Sheets("User").Range("A11").Value
       MsgBox "Sorry, dit kan je niet aanpassen!" & vbNewLine & "" & vbNewLine &
       "" & "De personeelskosten worden automatisch berekend op basis van je
       opgegeven begintijd, eindtijd & pauzeduur."
End Sub
```

Investments Screen

The Investments Screen is a screen that only links the Main Screen with the different Investments Screens. For the gamified intervention, only two investments screens were operational. However, more investments could be added. The operational investments screens are Training and Notebook Screen.

Training Screen

The Training Screen is also not much different in structure from the other screen like the Quality Control and Revenues Screen. However, from the Expertise, in the Training Screen an average mark is displayed by the following code.

```
'Expertise
 'Employee 1?
 If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Then
    ThisWorkbook.Sheets("User").Range("A120").Value = TextBoxAantalWerkstroom13
    TextBoxOpleidingsCijfer.Value =
    ThisWorkbook.Sheets("User").Range("A132").Value
 End If

    TextBoxOpleidingsCijfer.Value =
    ThisWorkbook.Sheets("User").Range("AF132").Value
```

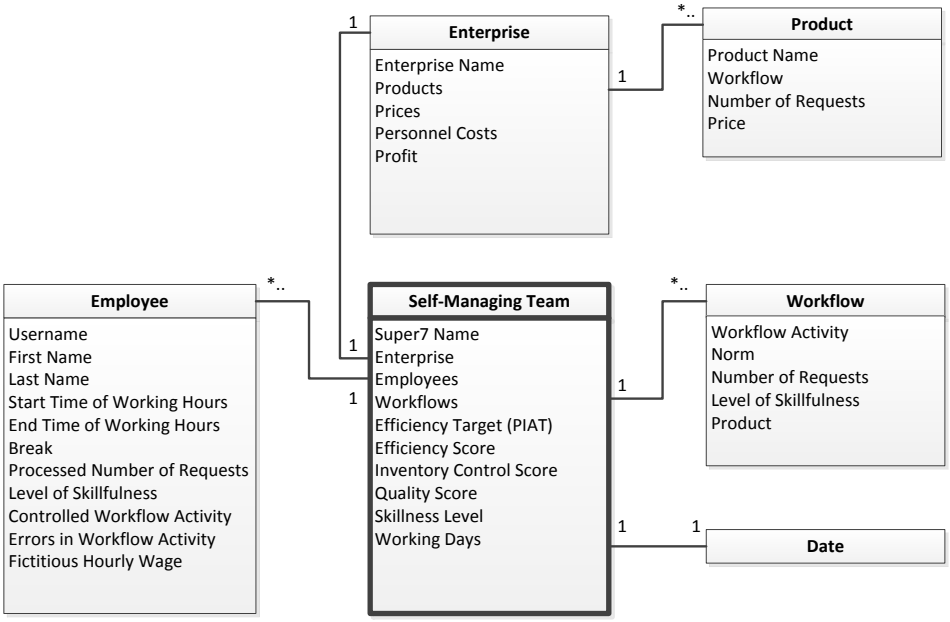
Notebook Screen

Lastly, the Notebook Screen is available for users to leave a note about the day, a note to be read by colleagues the next day or as feedback for the researcher. The notes of the day are available when the final results of the day are looked at. The remarks are shown the next morning in the Start Day Screen. The Gamification notes are logged by the designer as feedback, which is used as basis for error fixing or input for the evaluation session of the gamified intervention.

```
 'Medewerker 1?
 If Application.UserName = ThisWorkbook.Sheets("User").Range("A6").Value Then
     TextBoxEigenKeuze.Value = ThisWorkbook.Sheets("User").Range("A133").Value
     TextBoxMededelingen.Value = ThisWorkbook.Sheets("User").Range("A134").Value
     TextBoxGamification.Value = ThisWorkbook.Sheets("User").Range("A135").Value
 End If
```

A8.5 Back-end Design

The back-end is developed in an Excel Spreadsheet according to the following design. However for a large scale use, it is advised to use the design in an relational database of Access. The back-end design shows how the data is related.



For instance, a self-managing team can have multiple employees of which each employee has a username, a first name etc. A self-managing team also has multiple workflows, whereas each workflow has a specific workflow activity but also a production norm and a product in the gamification design. As each self-managing team has thought of its own company to run, their team data is linked to an enterprise or company and specific products. In the gamification design the enterprise was a coffee company and their products where types of coffee, each with their own price and linked workflow.

A8.6 Extensions to the Application

The developed application is used for an intervention during two weeks at ING operational services. For testing, a selection of functions is included. This selection only included the main functions that the application should perform, in order to research the effect of these main functions in depth. In order to avoid users being overwhelmed with additional features, some features were worked out to a certain extent in order to be useful for future use.

Link Internal Communication Profile Picture as Avatar

A possible extension to the application is to include avatars. In games, avatars are a game element to which is referred to as the character that a player controls in a game (Schell, 2008). An avatar can be powerful, as the user could relate themselves to the character in some way. This leads to the design question of what kinds of characters are best suited for the users to project themselves into. During a brainstorm session with four self-managing teams, all teams were asked to come up with a company name, product and to come up with a role for each employee in their chosen company. This brainstorm session resulted in a variety of characters, as among others the managing director, vendor, accountant, cashier.

Currently, only a team avatar is used in the application, which represents the fictitious company. Individual avatars could be included in order to personalize the application. The choice for a type of avatar could be a character, which could be visualized by a cartoon, icon or any other creative design. Another option would be

a profile picture. It is advised to include the profile picture as an avatar, as the application is used in a business environment. A second and secondly, as it also supports employees to have a contact picture for other internal communication systems of the organization.

Employees of ING have the opportunity to upload a profile picture for the internal network systems like intranet, Microsoft Office Outlook and Lync application. Not all employees are uploading a profile picture, which might be their preference or might be the consequence of their lack of knowledge on how to upload a picture in the system. Displaying a picture of the sender or recipient could enhance the feeling of personal contact, both in the internal systems of ING as in the developed application.

In order to use an employee's profile picture for both the internal communication systems as in the developed application, first the picture needs to be uploaded. In order to upload a picture for the internal communication systems of ING, the following steps need to be followed:

1. Download the AD Photo Edit Free Edition file & run the file "ADPhotoEdit .exe"
2. Search for the ING Corporate Key
3. Click on Edit Image
4. Click on Select new image
5. Choose a picture – preferably a square one
   Make sure the photo is max. 100 KB or upload the larger picture (of e.g. 2 MB) and then click on "Resize to recommended dimensions"
6. Click "OK" to save and wait for synchronization
   After about 15 minutes the photo is uploaded and visible in the internal communication systems

Subsequently, the code of the application should be extended. In the application, a shape should be created and named 'Foto' as referred to in this part of code.

```
Sub IncludeAvatar()
'ActiveWorkbook.Sheets(1).Shapes("MacroToestaan").Visible = True

Dim wb As Object
Dim doc As Object
Dim naampersoon As String
Dim corporatekey
Dim Mcode
Dim i

Mcode = Environ("Username")

Set wb = New InternetExplorerMedium
wb.Navigate "http://buzz.ing.intranet/ing-person.aspx?accountname=EUROPE%5C"
       & Mcode

    Do Until wb.ReadyState = 4
        DoEvents
    Loop

naampersoon = wb.Document.Title
corporatekey = Mid(wb.Document.Body.innerhtml, InStr(1,
       wb.Document.Body.innerhtml, "<SPAN class=heading>Corporate
       Key</SPAN>") + 47, 6)

'The corporate key is specific for ING
wb.Quit

Set wb = Nothing

'Check two locations for an available picture. The location is specific for
the intranet at ING.

If
       URLExists("http://buzz.ing.intranet/User%20Photos/Profile%20Pictures/E
       UROPE_" & Mcode & "_LThumb.jpg") = True Then
```

```
        ActiveWorkbook.Sheets(1).Shapes("Foto").Fill.UserPicture
        ("http://buzz.ing.intranet/User%20Photos/Profile%20Pictures/EUROPE_" &
        Mcode & "_LThumb.jpg")
ElseIf
        URLExists("http://buzz.ing.intranet/User%20Photos/" & corporatekey &
        ".jpg") = True Then
        ActiveWorkbook.Sheets(1).Shapes("Foto").Fill.UserPicture
        ("http://buzz.ing.intranet/User%20Photos/" & corporatekey & ".jpg")

End If
End Sub

Function URLExists(url As String) As Boolean
'Function determines if a profile picture is present
    Dim titel
    Dim checkb

    Set checkb = New InternetExplorerMedium
    checkb.Navigate url

    Do Until checkb.ReadyState = 4
        DoEvents
    Loop

    titel = checkb.Document.Title

    If titel = "HTTP 404 Not Found" Then URLExists = False Else: URLExists =
True

    checkb.Quit
    Exit Function
EndNow:
End Function
```

Integrate Scheduling of Short Team-Gatherings in Outlook Agenda

A second extension to the developed application is to implement an integrated link with the outlook agenda of self-managing teams. This might be useful as the application also intends to support the self-managing teams in the management of their activities. It could support a self-managing team member to easily schedule a short team meeting or stand-up and send all team members a meeting invitation and reminder. Such a meeting could be scheduled, if for instance the employee would like to discuss if they should upscale or downscale, based on their insights in the process work volume due to the application and their expectations regarding the inflow for the rest of the day.

To integrate the application with outlook, the following code should be included in the application. This code is used to schedule a 5 minutes self-managing team stand-up for which the coffee corner is settled as meeting location and a reminder with sound is played 10 minutes in advance.

```
Private Sub CreateAppointment()

  Dim oApp As Outlook.Application
  Dim oNameSpace As Namespace
  Dim oItem As AppointmentItem

  On Error Resume Next
  'Check if Outlook is running
  Set oApp = GetObject("Outlook.Application")
  If Err <> 0 Then
    'if not running, start it
    Set oApp = CreateObject("Outlook.Application")
  End If

  Set oNameSpace = oApp.GetNamespace("MAPI")

  Set oItem = oApp.CreateItem(olAppointmentItem)
```

```
  With oItem

    .Subject = "5 Minutes Self-Managing Team Stand-up"
    .Start = Date & " 12:30:00"
    .Duration = "5"

    .AllDayEvent = False
    .Importance = olImportanceNormal
    .Location = "Coffeecorner (boost our efficiency with some extra
       caffeine!)"

    .ReminderSet = True
    .ReminderMinutesBeforeStart = "10"
    .ReminderPlaySound = True

    Select Case 2
   'Do you want to display the entry first or save it immediately?
      Case 1
        .Display
      Case 2
        .Save
    End Select

  End With

  Set oApp = Nothing
  Set oNameSpace = Nothing
  Set oItem = Nothing

End Sub
```

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