

A new way of using persuasive games for multi-actor problems

AN EXPLORATIVE CASE STUDY ON THE TIGHTNESS OF THE
LABOR MARKET IN THE PORT OF ROTTERDAM

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An explorative case study on the tightness of the labor market of the Port of Rotterdam

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Abstract

This master's thesis explores the potential of persuasive games for addressing challenges in multi-actor systems. For many multi-actor system problems, the different actors need to take action to handle these problems. Persuasive gaming is proposed as a method that can stimulate taking action. This thesis identifies a gap in the applicability of existing persuasive games to multi-actor systems problems and proposes an alternative approach: game-mediated persuasive strategy.

The research uses an explorative strategy, defining seven criteria for evaluating the effectiveness of this strategy. A case study on the labor shortage in Rotterdam's port area is conducted, featuring a game utilizing a cat cafe metaphor to represent the labor market. The game is played by employees from both companies in the port area and the Port of Rotterdam itself. With observations and surveys, the effect of the game is evaluated.

One of the key insights is the emergence of collaboration as a crucial factor in tackling the labor shortage, an outcome not predefined in the game but contributed by the players. Therefore, it is recommended to the Port of Rotterdam to invest in collaboration between companies. While the findings are based on a single case study and thus lack generalizability, they show the promise of this underexplored approach of persuasive gaming in addressing multi-actor system problems.

In conclusion, the study underscores the potential of game-mediated persuasive strategy in promoting collaborative action among stakeholders in multi-actor systems. Although further research with a larger participant pool and across various contexts is necessary for broader validation, this study shows potential for a new method to help actors with multi-actor system problems. Game-mediated persuasive strategy deserves more research to further validate this method.

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Chapter 1: Influencing Multi-Actor Systems with Persuasive Gaming

In the Netherlands a lot of companies are struggling with recruiting enough employees. This is caused by the labor shortage. This leads to a variety of problems such as a shortage of teachers and not enough personnel for running the trains. It seems hard for companies to take action against this shortage because there are no simple solutions to reduce labor shortages.

This is an example of one of many challenges in today's society. Other examples of such challenges are the climate crisis and housing shortage. However, finding solutions for those challenges is often hard. This is especially the case for those challenges that involve different actors with different beliefs and views, such as the examples discussed. These kinds of challenges can be defined as multi-actor system problems. Finding solutions in a multi-actor system can be tough because of the multiple actors. Still, action is required for challenges such as climate change and the tight labor market. In this master thesis, persuasive gaming is proposed as a tool that can motivate actors to take action. Persuasive gaming can be defined as games that have the goal of changing the attitude, beliefs and behavior of the players of the persuasive games. In short, the goal of this paper is to explore the potential of using persuasive games for multi-actor system problems.

In this chapter, the problem of this master paper is defined. First, the definition and characteristics of multi-actor systems are explained. After this, persuasive gaming is discussed to explore the possibilities of persuasive gaming for multi-actor system problems. This is followed by defining the research question, which is answered using different sub-questions. Finally, a global outline for the rest of the paper is presented.

1.1 Defining Multi-Actor Systems

Before delving into the use of persuasive gaming it is first needed to gain an understanding of multi-actor systems. Van der Lei et al. (2010) described multi-actor systems as a specific kind of complex system that involves the participation of multiple actors, such as individuals, groups, organizations, or stakeholders. These systems have unique characteristics that differentiate them from other types of complex systems. These key characteristics are discussed to get a better understanding of multi-actor systems. The challenges that these characteristics bring are also discussed. Furthermore, each of these key characteristics is illustrated with a real-life example to show the implications of the different characteristics. The tight labor market in the Netherlands is used as an example. The labor market is the fictional market in which employers and potential employees find each other. When a labor market is tight, it means that there are not many potential employees in comparison to the job offers of the employer. The labor market is currently tighter than ever in the Netherlands (UWV, 2022). It is tough for companies to find enough employees for their businesses. The case of the tight labor market is discussed for each key characteristic.

The most obvious key characteristic is the presence of multiple actors with different interests, perspectives, and roles (van der Lei et al., 2010). These actors have their objectives within the system, which can result in conflicts between the actors. The interactions and relationships among actors

create the multi-actor system. In the example of the labor market, it is seen that the different actors have different goals. An example of where the interests of the actors can differ is labor immigration. For companies, labor immigration might be a good solution, because it is a relatively easy way to retain more employees. However, the government might not support this, because it brings more pressure on the housing market, as all the labor immigrants do need a place to stay while working. In this example, it becomes clear why multiple actors can result in problems. The views of the different actors might not agree. While one stakeholder thinks labor immigration is a good solution, other stakeholders might disagree.

Another key characteristic of multi-actor systems is the lack of a classic hierarchical structure between the different actors (Hermans et al., 2010). This means that there is no central control within this system. Different actors can make decisions that influence the system, but no individual actor can control the whole system. This makes decision-making more challenging in comparison to hierarchical structures, in which one stakeholder can make a decision for the whole system. In the example of the labor market, this lack of a hierarchical structure is also visible. A decision of the government to reduce taxes for people who work full-time can influence the system. However, employees still can decide to not work full-time. Furthermore, companies can also decide they do not need a full-time employee. Multiple actors can make decisions that result in change within the multi-actor system, but there is no central control. This makes finding solutions harder in these systems and forces actors to collaborate.

Complexity is another key characteristic. The complexity of multi-actor systems arises from the number of actors involved and the intricate web of relationships among them (Van der Lei et al., 2010). As the number of actors increases, managing their interests and perspectives becomes more challenging. Each actor's behaviour and decisions can affect the system. In general, more actors result in more complexity within the multi-actor system. This influence of the number of actors becomes more clear when looking at the labor market. For example, if only one or two companies need to agree on a decision this is fairly easy. However, when a lot of companies, labor unions and governmental institutions need to come to an agreement, this proves to be a lot more challenging as many more actors need to agree. Thus, generally speaking, more actors within a multi-actor system results in more complexity.

Uncertainty is also a key characteristic of multi-actor systems, particularly regarding actor behaviour (Michelis, 1997). Actors may have different priorities and opinions, making it difficult to predict their actions. However, the actions of other actors can matter a lot. For example, policies of the government with regard to the labor market can influence the possibilities of companies. Therefore, trust plays a crucial role in managing this uncertainty and having effective collaboration and cooperation among actors. Besides the uncertainty of the behaviour of other actors, other uncertainties are often in place as well. An example of this is that the labor market can be influenced greatly by an economic recession, but it can hardly be predicted if and when this will happen. This uncertainty makes multi-actor problems even more complex.

Now, the key characteristics of multi-actor systems are explained. However, it also became clear that solutions to multi-actor system problems can be challenging because of these characteristics. However, it was also concluded that taking action is often necessary to handle multi-actor system problems.

In the example of the tight labor market the problems because of the tight labor market can already be seen in society. As a consequence of the tight labor market, schools are being partially closed because of the lack of teachers and trains riding less frequently because of the labor shortages of the NS (NOS, 2022a). This is just one example of a multi-actor system, but this need for action can be found in many other multi-actor systems as well. Another example of such a multi-actor system problem is climate change, for which taking action is also complicated because of the many actors involved. This raises the question of how multi-actor systems can be supported to take action. Fortunately, there are various tools to support multi-actor systems. These interventions can include decision support systems, such as multi-actor multi-criteria analysis, and system analysis (Macharis et al., 2012; Hermans et al., 2010). One of these tools that is offered to support multi-actor systems is serious gaming (Mayer, 2008). Mayer argues that specifically simulation games are able to address complex problems within a multi-actor system (Mayer, 2008). To get a better understanding of how games can have this effect, it is needed to get a closer look at the effect of serious games on multi-actor systems and problems in these systems.

Before focusing on simulation games, it is important to focus and understand the concept of the broad term of serious games. When looking for the definition of serious games, various definitions are found. One definition found is "A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment" (Michael & Chen, 2006). However, other researchers argue that this definition is too small, as this excludes other serious games, such as games that are more focused on academic research (Breuer & Bente, 2010). Many more definitions are used by various researchers, but what seems to be agreed on is that serious games are games that are used for more than just entertainment (Susi et al., 2007). Serious gaming is widely used nowadays in various ways, such as a research method and as a tool for behavioral change and learning (Wilkinson, 2016). In this thesis, the focus is on serious gaming for multi-actor systems.

When focusing on serious gaming and its use for complex multi-actor systems, it becomes clear that there is certainly a role for gaming within complex multi-actor systems. Mainly simulation games are being used in games that address multi-actor systems (Castronova & Knowles, 2015; Savic et al., 2016, Bekebrede & Mayer, 2006). Simulation games can be described as '*A representation of a set of key relationships and structure elements of a particular issue or a problem environment, where the behavior of actors and the effects of their decision are a direct result of the rules guiding the interaction between these actors*' (Wenzler, 2003). In 1974, Duke already linked simulation gaming and complex systems together, arguing that simulation games can help with communication (Duke, 1974).

When looking at Mayer (2006), discusses the potential of serious games in representing and experimenting with multi-actor policy scenarios. However, it primarily focuses on understanding the system and exploring the impact of different policy outcomes. There is less focus on the effect on the players of the game. The players are more used as a tool to get certain results, as (policy) games are the only method in which real people are an intrinsic part of the model. It is mentioned that change and learning can take place, but this is not the main goal of this approach. What this change would mean for the participants is not elaborated on.

Geurts & Duke (2007) are focusing a bit more on changing the behavior, with one of their 5 criteria being Commitment to Change. However, this is more used in a scenario in which different policies are explored. There is less focus on a crucial need for action, which is often needed in multi-actor systems. This raises the question if these types of games are suitable for stimulating actors to take action.

Looking at the use of serious gaming for multi-actor systems, there is a clear lack of focus on changing the behavior or motivating players to take action. It was seen that for multi-actor system problems, action is needed. The games that are used now are usable for addressing problems or to give insight into the system, but are not suitable for changing the behavior of actors. Fortunately, one specific serious game, persuasive gaming, focuses specifically on changing the attitudes, behavior, and beliefs of players. This raises the question if there is a role for persuasive gaming for multi-actor system problems. To explore this, it is first needed to gain more information about persuasive games, which is discussed in the next sub-session.

1.2 Persuasive Games

To get an idea of what persuasive gaming can do for multi-actor system problems it is first needed to get an understanding of how persuasive games are defined. When looking at persuasive gaming, these types of games specifically focus on changing the attitudes, behavior, and beliefs of players (Siriaraya, 2018). This is the main goal of persuasive gaming. Siriaraya (2018) mentions that a key difference between entertainment games and persuasive games is that persuasive games are aimed at changing the behavior or beliefs of a player in the real world. This change is the primary goal of persuasive gaming. Bogost (2007) argues that persuasion is not about words or images, but is rather about rule-based interactions and representations. In persuasive games, this means that by playing a game with certain rules and actions, persuasion can take place. Persuasion games thus have a focus on actually influencing behavior and attitudes, which is exactly what is needed for multi-actor system problems. However, persuasive games are not used for multi-actor system problems. This raises the question of what persuasive games are used for and why they are not used yet for multi-actor systems. First, it is discussed what persuasive games are used for nowadays.

One of the fields that uses persuasive gaming is the health sector. Examples of the goals of the serious games in this sector are games that motivate players to quit smoking or to be more active ((Mulcahy et al., 2021; Oyebode, et al., 2020; Zhao, et al., 2020). These games promote a more healthy lifestyle through gaming, aiming to influence the lifestyle of the players. In many other fields, persuasive games can be found with various goals, such as making players more environmental-friendly or making people aware of the danger of safety around train stations (Csoknyai, et al., 2019; Mulcahy et al., 2021). To get a clear idea of what such a game can entail, we focus on one such game, the Veevia Cancer Game (Wei, 2007). In this game, a player walks through a virtual body of a human and explores different causes of cancer. In the lungs, for example, it can be found that a permit to smoke results in no cancer. In other places in the virtual body, it is shown that no alcohol and no junk food also helps with preventing cancer. The game promotes a healthy lifestyle to avoid getting cancer, in the hope that players of the game adjust accordingly to this. This is a specific example of how a persuasive message can be communicated by games.

What is remarkable about all these examples is that all the games discussed have a very specific message that they convey with the game. To see if this is a trend for all persuasive games, a search is

done on Google Scholar. We are interested if persuasion games have the goal of delivering a specific message to the players or not. The search term used is '*persuasive serious game*'. To get a correct view of the current situation, only articles since 2019 are reviewed. Only papers that discuss specific persuasion game(s) are reviewed. The first 20 search results are analyzed, Which resulted in an overview of the following 9 games, which can be seen in Table 1.

Table 1: A review of persuasive games in the literature

Number	Name of the game	Does the game intend to convey a specific message?	Theme	Source
1	Modification of Recovery Rapids	Yes	Environment	(Fox, et al., 2020)
2	advertising literacy serious mini-game platform	yes	advertising	(De Jans, et al., 2019)
3	Dumb Ways to Die	Yes	Train safety	(Mulcahy et.al., 2021)
4	CityGT	Yes	Safety on road	(Mulcahy et al., 2021)
5	Quit for Two	Yes	quit smoking	(Mulcahy et al., 2021)
6	My Quit Buddy	Yes	quit smoking	(Mulcahy et al., 2021)
7	Apolis Planeta	Yes	reduce energy use	(Csoknyai, et al., 2019)
8	TreeCare	Yes	Promote being active	(Oyebode, et al., 2020)
9	a gamified fitness assistant	Yes	Promote being active	(Zhao, et al., 2020)

When looking at the researched persuasive games, it is seen that all games have a very specific goal embedded in the game, such as quitting smoking. However, for multi-actor systems, this is not a suitable approach. As discussed, One key characteristic of multi-actor systems is the presence of multiple actors, who all have different interests, perspectives, and roles on the problem (van der Lei et al., 2010). For problems in multi-actor systems, the desired behavior of people is less defined and generally not agreed upon, which makes persuasive games as seen in the literature review not suitable. This explains why persuasive games are not yet used for multi-actor systems. However, the goal of persuasive gaming, being a change of beliefs or behavior could be beneficial for multi-actor

systems. This is because there is a need for action to handle problems within these systems. This raises the question if there is another way of approaching persuasive gaming, which is more suitable for reaching change in behaviors or beliefs for specifically multi-actor problems. To explore this, the focus shifts to De La Hera Conde Pumpido, who identified different types of persuasive strategies.

1.3 Three Persuasive Game Strategies

De la Hera Conde Pumpido (2017) identified three types of persuasive strategies that can be used for persuasion via gaming: exocentric, endocentric, and game-mediated persuasive strategy. The research of De La Hera Conde Pumpido specifically focuses on digital games, but the three strategies that are identified can easily be applied to physical games as well. To gain a deeper understanding of persuasive games, the three types of strategies are discussed.

First, exocentric persuasive games are games that convey a specific message. The examples discussed all used this way of persuasion. These types of games aim to influence the behavior of the players beyond the game, which is done by providing information in the game. These types of games have a built-in persuasive intent, meaning that the game is designed with a clear persuasive element in the game. The game itself tries to convince the players to change their behavior. The example given by De la Hera Conde Pumpido (2017) is the Veevia Cancer Game (Wei, 2007), which is a game that is designed to motivate cancer patients to follow a healthy lifestyle because this has a positive effect on the effectiveness of the cancer treatment. This style of persuasion is used for the games discussed previously when looking at the trends of persuasive gaming.

Second, endocentric persuasive strategies are games that try to motivate players to keep playing the game or motivate players to do tasks that they are expected to do. For this type of gaming, no specific message is conveyed as we have seen for exocentric persuasive games. Endocentric games motivate players to just keep playing the game. This can be used to make certain activities easier or to make players of the game more efficient with a specific task. An example that is mentioned in this paper is the game SnowWorld (University of Washington Harborview Burn Centre in Seattle, 2011). This game is used to distract patients with severe burn injuries from their wound care. The goal of the game is to keep players engaged and distract them from their pain.

Third, a game-mediated persuasive strategy is discussed. When talking about game-mediated persuasive strategy, the game itself is not designed to persuade the players directly. Contrary to exocentric persuasive games, the games that are used for the game-mediated persuasive strategy do not have a specific message embedded in the game. However, by using a game in a specific context, this strategy can still lead to persuasion. This strategy can be used to change or reinforce the attitude of players towards a concept that is separate from the game. Hung (2007) has found that offline interactions outside of digital games also have an important role in persuasion, meaning that the context of a game is also important, besides the game itself. Three types of game-mediated persuasive strategies are defined by De La Hera Conde Pumido.

Firstly, a persuasive game can be facilitated with the objective of a specific interpretation of the game. In this case, one game can be used for different target audiences with different persuasive goals in

mind. Based on the goal of the specific target audience, the facilitating and the setting around the game can be amended for each session.

Secondly, a game-mediated persuasion strategy can frame a persuasive message with a game. By combining a message with an unexpected message frame, being the game, persuasion can be reached. In other words, the game is utilized as a frame to help convey a persuasive message.

Lastly, a game can also be used as a tool for mediation between transmitters and receivers. In this case, the game itself is not used to convey a specific persuasion message. An example of this mediation given by De La Hera Conde Pumpido (2017) is The Survivor Games, which is a website that brings teenagers with cancer together to play games, which allows them to get in contact with others who deal with the same struggles concerning their cancer. The game is merely used as a tool to facilitate interaction within this group.

We have seen that persuasive games can be used to deliver a specific message with the game, which seems to be the current trend in persuasive gaming. However, it is not necessarily needed to have a prescriptive message within the game. Serious games can also be persuasive, without having a persuasive message embedded in the game itself, as seen in the game-mediated persuasive strategy. A type of game, which has no clear persuasive element in the game itself, but can persuade stakeholders to take certain actions could be useful for multi-actor problems, such as the labor market. Instead of persuading the players with a very specific message within the game, the game can be used as a mediation tool, which possibly leads to persuasion. Here is a knowledge gap, as this approach for persuasive gaming is not yet used. In this thesis, the use of persuasive gaming for multi-actor system problems using a game-mediated persuasive strategy is explored.

1.4 Research questions

Now, that the research gap is clear, the following research question arises:

How promising is a game-mediated persuasive strategy to change the behavior of stakeholders to help solve multi-actor system problems?

To research this question, different methods can be used. However, many research methods are also not suitable. First of all, this terrain of research is new, as no literature was found on this specific persuasive strategy used for multi-actor systems. Therefore, research methods such as a literature review or a meta-analysis on different papers are not suitable. As this research focuses on a new concept, it cannot be expected that this research gives a definitive answer about the use of persuasive gaming for multi-actor system problems, which is thus not the goal. However, a first step can be made into this domain with this research, which makes this research explorative.

For this thesis, an experiment is done which focuses on a specific case study of such a multi-actor system problem. The specific case is the tight labor market of the port area of Rotterdam. This case was chosen because a collaboration with The Port of Rotterdam was possible, meaning that real stakeholders could get involved in this research. In this experiment subjects from different companies in the port area of Rotterdam played a game in an experiment which is specifically designed with a

game-mediated persuasive strategy in mind. With qualitative and quantitative research methods, being observations and surveys, the attitudes and behavioral intentions are reviewed and discussed. With this explorative experiment, an answer can be given to the research question.

This question is addressed by answering the following sub-questions.

RQ1: What criteria can be used to assess how promising a game-mediated persuasive strategy is for behavior change in multi-actor systems?

RQ2: What is the game design for a case study on the tight labor market in the Port of Rotterdam?

RQ3: What experimental design is suitable for this study?

RQ4: What are the qualitative and quantitative results of the experiment?

RQ5: How can the results of the experiment be interpreted and generalized?

In the following chapters, the different sub-questions are answered. In chapter two, criteria for a game-mediated persuasive game for multi-actor systems are designed. In chapter three, the case study, being the tight labor market for the port area of Rotterdam is introduced and a game is designed for this multi-actor problem. Chapter four focuses on the precise set-up of the experiment. In chapter five the results of the experiment are presented. The results are discussed in chapter six. Finally, in chapter seven the sub-questions and main research question are answered and discussed.

Chapter 2: Criteria

In this chapter an answer is given to sub-question one which is:

Which criteria can be used to review a game-mediated persuasive strategy for multi-actor systems?

The criteria in this chapter are used to reflect on the game experiment in the discussion. The criteria are based on the literature that is already in place on multi-actor systems and games for multi-actor systems. First of all, When looking at serious gaming for multi-actor systems, two important characteristics are mentioned by Mayer (2008) when it comes to serious games for (complex) multi-actor systems. Secondly, 5 criteria of Duke and Geurts (2004) are described and added.

being emergence and immersion. Therefore, it is needed to define emergence and immersion.

Mayer (2008) mentions that emergence and immersion are both important for games for complex multi-actor systems. Therefore, it is needed to understand these two concepts.

Ladyman et al. (2013) claims that emergence refers to the idea that new properties, processes, or behaviors can arise as a result of the interactions between simpler components. It suggests that the whole system has characteristics that cannot be solely explained by looking at its individual parts. There are two main ways to understand emergence: epistemological and ontological. Epistemological emergence refers to situations where the lack of reduction (simplifying or breaking down a system) is either in principle or in practice. Ontological emergence, on the other hand, deals with the question of whether emergent phenomena have a real, independent existence. Mayer (2008) explains emergence in real-life and in games as *'a limited set of elements and rules can lead to an (almost) infinite number of outcomes'*. This can be seen in for example chess. How exactly a game works or can be played is not just known by reading the rules, but can only be learned by playing the game. If a real-life situation is simulated using serious games, it is possible that the same emergence can be found in the game as in real life.

Another important factor is immersion. However, when looking for an exact definition of immersion for serious games, there is again not a definition that is broadly agreed on. In this paper, we use the suggestion of Jennett et. al. (2008), that immersion has to do with flow, cognitive absorption, and presence.

Flow, as described by Csikszentmihalyi (1990), refers to the state of the experience where individuals become deeply involved in an activity to the point where they lose track of time and feel fully

absorbed. It is characterized by clear goals, high concentration, a sense of control, a distorted sense of time, and intrinsic rewards.

Cognitive absorption refers to a state of deep involvement. It is characterized by temporal dissociation, attention focus, heightened enjoyment, control, and curiosity. The concept of cognitive absorption focuses on users' reactions to information technology and their attitudes toward it.

Presence is a term commonly associated with virtual reality experiences. It refers to the psychological sense of being in a virtual environment. Presence can be subjective, describing the feeling of being present, or it can be measured based on the coupling between perception and action in the virtual environment, indicating the successful support of actions in that environment.

Mayer (2008) claims that immersion is needed and that games are immersive to make a game engaging for players. Immersion is what makes people involved and lost in another reality within a game. This can lead to engagement, commitment, and a high sense of awareness. These characteristics can have a positive effect on personal change, which is linked to the goal of persuasive games. Both emergence and immersion need to be taken into account while designing the game later on.

Next to emergence and immersion, five other criteria are added, based on the "5C" criteria proposed by Duke and Geurts (2004). While policy games and game-mediated persuasive strategies may have distinct characteristics, there are significant overlaps in their objectives and approaches. Both aim to engage participants, foster collaboration, facilitate the exploration of solutions, and bring about behavioral change. Therefore, the criteria used by Duke and Geurts are likely also applicable to game-mediated persuasive strategies. For each criteria it is described what this entails for game-mediated persuasion. These criteria serve as a basis for the criteria used to assess the effectiveness of the game in achieving its objectives.

Understanding Complexity: Game-mediated persuasive strategies should aim to enhance participants' understanding of the complexity of the problem within the multi-actor system. For policy games, it would mean that the game needs to represent the problem realistically. For a game-mediated strategy, it is needed that the complexity of the problem is understood, but the game can also be a metaphor for the problem instead of a realistic representation. Evaluating the game's ability to improve participants' understanding of the complexity will help assess its effectiveness in promoting informed decision-making and problem-solving.

Improving Communication: Effective communication is essential for addressing multi-actor system problems. Game-mediated persuasive strategies need to facilitate communication among participants, enabling them to exchange ideas, perspectives, and insights related to the problem. Evaluating the communication can indicate the effectiveness of the game session.

Stimulating Creativity: Problems in multi-actor systems often require creative and innovative approaches for effective solutions. Game-mediated persuasive strategies should stimulate participants' creativity, encouraging them to think outside the box and explore unconventional solutions. Evaluating the game's ability to stimulate creativity will provide insights into its effectiveness in promoting new ideas and approaches.

Consensus Building: Multi-actor systems involve diverse stakeholders with different perspectives and interests. Game-mediated persuasive strategies should provide a platform for building consensus among the participants, facilitating dialogue, and narrowing the gap between different viewpoints. Evaluating the game's impact on consensus building will help determine its effectiveness in promoting collective decision-making and finding common ground.

Commitment to Action: Game-mediated persuasive strategies should inspire participants to commit to taking action beyond the gameplay session. The game should motivate participants to apply the knowledge gained and the solutions explored within the game to real-world contexts. Evaluating the game's ability to foster a commitment to action will help assess its effectiveness in motivating behavioral change in multi-actor systems.

Emergence: The game used for the game-mediated persuasive strategy should encourage the emergence of complex and unpredictable outcomes. The game needs to provide opportunities for unexpected interactions and emergent behaviors to occur. Evaluating the degree of emergence is hard within the game, but unexpected events can point to emergence. This can help with preparing participants to handle unforeseen challenges and outcomes.

Immersion: An effective persuasive game using the game-mediated persuasive strategy should promote a high level of immersion for the participants. The game should create an engaging and immersive experience that captivates the players' attention and facilitates a deep sense of involvement in the problem-solving process. Evaluating the level of immersion in the game can help determine its effectiveness in enhancing participants' motivation, focus, and emotional connection. The level of immersion can be measured by survey questions.

By utilizing these criteria, we can evaluate the effectiveness of the serious game in achieving its objectives within the context of a game-mediated persuasive strategy for multi-actor systems. These criteria provide a comprehensive framework for deciding the effectiveness of a particular game using the game-mediated persuasive strategy. In this research, these criteria are used for the case study of the labor market, which is introduced in chapter three.

Chapter 3: Game Design

In this chapter, the game requirements and game rules are presented that are used for this research. The research question answered in this chapter is:

What is the game design for a case study on the tight labor market in the Port of Rotterdam?

The case for which a game-mediated strategy is used in this research is the labor market. Firstly, It is needed to gain a deeper understanding of the tight labor market. The tight labor market is chosen as a case study for this research because many stakeholders are involved in this problem, making it a multi-actor system. Furthermore, this case is also socially relevant, as more and more problems occur because of the situation in the labor market in the Netherlands. lastly, a collaboration with the Port of Rotterdam was possible, meaning that real-life actors could get involved in this research. After gaining a better understanding of the tight labor market, the game design is presented.

3.1 Tight labor market

To be able to design a fitting game, it is first needed to get an understanding of the case at hand, which is the tight labor market in the Netherlands. A growing concern for companies in the Netherlands is the tight labor market. Many companies struggle to find enough employees, resulting in undesirable situations like schools being closed for one day in the week or high workloads as is seen for companies operating at Schiphol Airport and NS (NOS, 2022a). The UWV keeps track of how tight the labor market is and concluded that the Dutch labor market is currently tighter than ever (UWV, 2022). For many sectors, more jobs are available than people searching for a job (UWV, 2022). The current situation is structural, meaning that the problematic labor market will not be resolved in a few years (de Beer, 2022). This is because the working population is shrinking, especially because of the ageing population (de Beer, 2022). The societal impact should not be underestimated and is already perceptible. The number of trains per hour is lowered, some social places are closed and the wait times for the delivery of goods expand (EenVandaag, 2022). Other effects are visible in the domain of education and health care, with problems such as a lack of qualified teachers to provide good education or long waiting times for urgent operations (EenVandaag, 2022). Therefore, it is needed to find solutions to this problem to reduce the negative impact of the current labor market. For the case study, the focus is specifically on companies at the Port of Rotterdam, which also struggle more and more with recruiting enough employees (NOS, 2022b). The Port of Rotterdam has asked for help with this current problem in their port.

The definition of a tight labor market is used to describe the situation when the number of vacancies is relatively high in comparison to job seekers. The UWV (Uitvoeringsinstituut

WerknemersVerzekeringen) has defined the labor market mathematically for the Netherlands with a tension indicator on the labor market, which indicates how tight the labor market is over time.

The calculation used is the following:

The indicator is used to define the tightness of the labor market as can be seen in table 2 (van den Berg, 2022).

$$\frac{\text{Estimated open vacancies}}{\text{Job seekers with less than 6 months of unemployment benefits}}$$

Table 2: levels of tightness of the tension-indicator

Level of Tightness	Ranges
Very wide	0.06-0.25
Wide	0.25-0.67
Average	0.67-1.50
Tight	1.50-4.00
Very tight	4.00-16.00

In figure 1, the tension-indicator of the UWV is shown from 2018 to 2022 (UWV, 2023). Since 2022 we can define the labor market in the Netherlands as very tight, following the definition from UWV. This means that there are very few job seekers in ratio to the estimated open vacancies. This is problematic for many industries, as discussed.



Figure 1: tension-indicator of the labor market in the Netherlands (UWV, 2023)

It is clear that the current situation in the labor market is very tight, which also raises the question of what the causes are of the tight labor market in the Netherlands.

One main reason for the labor shortages is the ageing of the workforce. When looking at the data of Centraal Bureau Statistiek (CBS, 2022), we see a growth in the potential labor force, which is visible in figure . The labor force is defined as everyone from age 20 to the retirement age. It is expected that this growth of the potential labor force will continue.

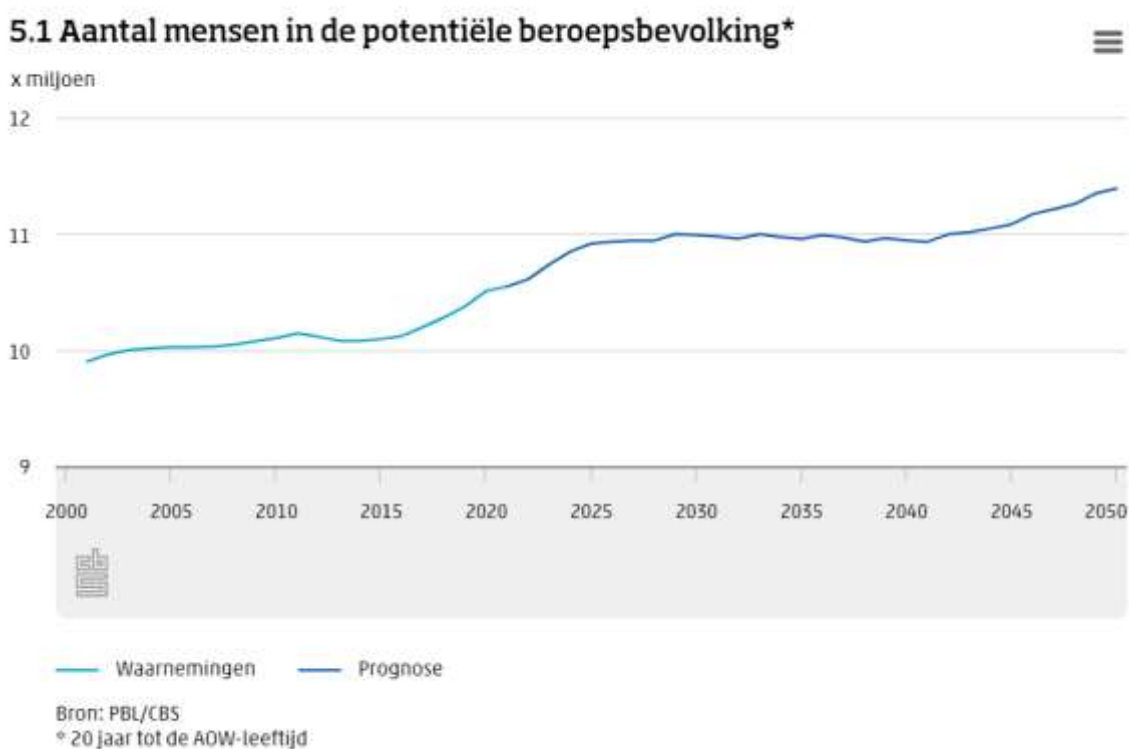


figure 2: Potential labor force in the Netherlands.(CBS, 2022)

However, if this data is compared with the whole Dutch population and the expected growth of the Dutch population, we see that the ratio of the potential labor force is shrinking(CBS,n.d.). In 2001, this ratio was $(9,905/15,99)=61,9\%$. In 2022 this ratio has already shrunk to $(10,616/17,95)=59,1\%$. When looking at the prognosis of the potential labor force and the Dutch population, the prognosis is that in 2050 the potential labor force is $(11,397/19.79)=57,6\%$. This shows that the shrinking of the potential labor force in comparison to the Dutch population is structural.

Another reason that the Netherlands struggles with a tight labor market is the high number of people who work part-time. When looking at labor participation in 2016 in people, the Netherlands is at the fourth highest place of EU countries, following Sweden, Germany and Estonia (CBS, 2023). However, when making this same comparison of labor participation in FTE (Fulltime-equivalent), the Netherlands is ranked in the 5th lowest place(CBS, 2023). This shows that many people work in the Netherlands, but part-time work results in low working participation when expressed in hours. When

looking more closely at part-time workers, we see that nowhere else in the world there are as many people working part-time (ibo deeltijdwerk, 2019). Almost 20 per cent of the men work part-time and almost 70 per cent of the women work part-time (ibo deeltijdwerk, 2019). This culture of working part-time has a negative impact on the availability of labor, even though the Netherlands has a high labor participation in people.

Another issue is the stagnation of labor productivity growth. For many years, the labor productivity of the Netherlands grew a lot. In the last years, this growth has become less in comparison with other countries. Labor productivity growth could have a positive impact on the labor market. The stagnation of this labor productivity growth means a less positive effect on the labor market (Ministerie van Economische Zaken & Klimaat, 2022). These different issues together have resulted in the tight labor market we are currently experiencing.

To get a more profound insight into the specific struggles companies are dealing with, interviews were conducted with several interviewees who are involved in companies within the port area of Rotterdam. In Appendix 1, a more detailed report on the findings of the interviews can be found. They are all facing a tight labor market and its accompanying challenges. Even though these companies are operative in different industries, they are all looking for the same type of job applicants such as technicians and other profiles that require MBO. These shortages are the result of a high outflow due to the high average age of their workers. Each company also faces competition on salary. However, during the interviews, it soon became clear that despite the fact that they are experiencing the same challenges, their opinions on how to solve these issues differ greatly. This is illustrated by their different wage politics. Some interviewees thought it would be better to stop the competition, while others thought that competition on salary worked in their benefits. Labor market experts were also asked about this problem, but even for experts, no simple answer could be given on the question if this competition is good or bad for the Port sector.

These differences in opinion demonstrate the complexity of the matter and show that indeed the difference in view on the problem, which is typical for multi-actor systems. This demonstrates that designing a serious, persuasive game with a clear message embedded in the game is not suitable for these types of problems. Therefore, this case is suitable for a game-mediated persuasive strategy.

3.2 Game Rules

For the game design, the criteria were used and different iterations were made. In this chapter the game rules are presented, giving answer to the research question:

What is the game design for a case study on the tight labor market in the Port of Rotterdam?

3.2.1 Game objective

At the start of the game, players are given the objective to start a successful cat café in a small city where stray cats roam freely on the streets. A cat café is a café where customers can buy a drink while surrounded by cats. The primary focus of the game for the players is to attract cats to their café, as the cats have the autonomy of where the cats want to stay. Players earn coins after each round, which they can use to purchase various items. The game rules are gradually revealed during the gameplay, which is communicated to the players. For larger groups, teams of two or three players are made for smaller groups every individual starts their own cat café. Three or four cat cafés are needed to play this game.

3.2.2 Start of the game

The game begins with each team brainstorming a name and a slogan for their cat café, which is recorded by the game host. This name serves as the name for the team as well. After this, each team is provided with 5 coins. The first action they can take is to buy cat food, which costs 1 coin per unit. After determining the amount of coins to spend on cat food, the coins are collected by the game host. The number of cats obtained by each team corresponds to the number of cat food units purchased. In the beginning, the cats of different colors are randomly assigned between the teams. The cats symbolize employees within the game, although this information is not explicitly conveyed by the game host. After each round, the cat food is collected by the game host. Each team then receives coins based on the number of cats they own. Two coins are given to each team, with an additional coin awarded for each cat in their cat café.

3.2.3 Rounds and actions

In the next rounds, players can also purchase actions beyond cat food. The available actions and their respective costs are as follows:

- Cat food (1 coin per unit)
- Cat toy (3 coins per toy)
- Robot cat (8 coins per robot cat)
- Wellness day for cats (5 coins)

All actions, except for the wellness day, can be purchased multiple times per round. Cat food and wellness day are returned to the game host at the end of each round. Robot cats and toys remain with the players. The choice of actions by the players influences which color cat they will receive.

- Black cats: Food (representing salary)
- White cats: Toys (representing leisure)
- Yellow cats: Wellness (representing education)
- Brown cats: No specific trigger

It needs noticing that brown cats are introduced to ensure game balance. If a café decides to not purchase any food, all cats leave the café, as food is a basic need for the cats. Following players' actions, new cats are distributed. There are no definite rules for distributing the cats. This is decided on by the game host. It should be noted that players are not informed about the meaning behind the colors of the cat or the link with the labor market. The players need to figure this out for themselves. Based on the number of cats owned, teams receive coins again. Teams with robot cats receive additional coins, as robot cats represent automation, allowing for greater profitability with fewer employees. The exact amount of extra coins awarded to teams with robot cats is determined by the game host, who needs to ensure the game balance of the game.

Round three follows the same step as round two. However, in this round, cats located are starting to move between the cat cafés. For example, if one café focuses on purchasing cat food while another focuses on buying toys, black cats will migrate to the café that invests in food and white cats relocate towards the café with more toys. There are no specific rules dictating the precise moving of the cats. This is decided by the game host, who needs to ensure logical cat movements.

In round four, a last rule is implemented. From now on, teams are allowed to create their own custom actions. Teams propose these actions and the game host determines their costs. The effects of these custom actions are logically determined by the game host. For instance, food-related actions, such as buying fish, may attract black cats, while entertainment-focused actions may appeal to white cats, and actions centered around cat nurturing may attract yellow cats. Custom actions that do not fit into these categories may be rewarded with brown cats. From this round onward, only a limited number of new cats are introduced, and most of the cat dynamics revolve around cat movements between the cat cafés, symbolizing the tightness of the labor market.

3.2.3 Final round and conclusion

The game continues until the game host determines that the players have a sufficient understanding of the game or when the players are no longer motivated to continue. At this point, the last round is announced, allowing all players to utilize their remaining coins one last time to attract cats. The game does not explicitly declare a winner, because the focus is on trying to understand the game mechanics and the link between the game and the labor market.

Chapter 4: Methods for the experiment

In this chapter, the experiment design is discussed that is used for the data collection and analysis. This research is approved by the ethical committee of the TU Delft under application number 3164. In this research, a Fully mixed sequential dominant status design is used (Leech Onwuegbuzie, 2017). The quantitative data is dominant for this research. In this chapter, the research question that is answered is:

What experimental design is suitable for this study?

4.1 Participants

The participants are all recruited via the Port of Rotterdam and are employees of the Port of Rotterdam or employees of other companies within the port area of Rotterdam. 158 people were invited to take part in this experiment. All participants are involved in a way with the tight labor market. Many participants are working for Human Resources, but also managers and trainees took part in this experiment. The participants took part in the experience in one of four sessions. The number of participants per session differs from 2 to 10 participants. No reward was given to the participants, other than the result of this research. All participants agreed to the experiment with an informed consent form. Both the pre-survey to post-survey also agreed on accepting the opening statement. It needs to be noted that two participants were interviewed for this research. In the interview, it is explicitly mentioned that the interviewee cannot communicate the content of the interview with others within the company. This is to ensure that participants do not have knowledge they are not supposed to have.

4.2 Materials

The materials used are given in the following list.

Materials

Game

PowerPoint presentation

Pre- and post-survey

Notes of observations

Informed consent documents

location

Facilitator

First of all, a game is designed which is used for the experiment. The game design is described in Chapter 3. The game, called 'Cat café' is a paper-based game and includes cards for the cats in the colors black, white, yellow, and brown, cat toys, wellness-day, cat food, and robot cat. Furthermore, coins with a value of 1, 5, and 10 were used. A PowerPoint presentation was prepared and used for the experimental session, which can be found in Appendix 2. The PowerPoint presentation was used to guide the experiment and explain the game.

To gather data, a pre-and post-survey was used. Surveys were used during this research. The full survey in Dutch as well as an English translation can be found in Appendix 3. The surveys were made and distributed via Qualtrics (www.qualtrics.com) during April, May, and June of 2023. The survey was tested by 3 non-participants. SPSS Statistics 28 is used to analyse the data retrieved from the surveys. For two of these tests, by non-participants no problems were found and the survey was seen as understandable and user-friendly. For one of the testers, the different options of the survey were changed to answers that were different from the options given through Qualtrics. After contact with the service desk of Qualtrics, it was found out that it was probably because of translation settings on the mobile phone. No such problems were mentioned by participants.

First of all, the survey used a set of statements to measure participants' views on the tight labor market and the influence of individuals and companies on that market. These statements aimed to capture participants' perceptions of the labor market dynamics and factors related to job switching and were specifically designed for this research. Both the pre and post-survey included these statements to make it possible to compare the views of the participants before and after the game session. The statements were rated on a 7-point Likert scale. A Likert scale of 7 points means that there are seven options between completely agree to completely disagree. 21 items were rated, of which 4 of these items were not used for computing factors. These 4 questions focused on reasons why employees would switch their jobs. To control if the designed factors are indeed computed well from the different statements, factor analysis is done. The different factors that were aimed to compute with these questions are view on the tightness of the labor market, individual knowledge, position of the company, collaboration between companies, influence and position of sector. The exact way of composing can be found in Appendix 4.

To gather information about the game experience questions the Game Experience Questionnaire (GEQ) of Ijsselstein et. al. (2007) was used. The GEQ was used to assess participants' game experience and enjoyment. It consists of 14 statements rated on a 7-point Likert scale. The participants were asked to indicate their feelings and experiences while playing the game, including factors such as interest, success, boredom, challenge, immersion, and affect. Component scores were computed for competence, sensory and imaginative immersion, flow, tension, challenge, negative affect, and positive affect. The precise statements for each factor can be found in Appendix 5.

The post-survey also included some questions for reviewing the game and the session. This was used to control if the game was understandable and did a good job of representing the tight labor market. The different statements were graded on a 5-point Likert scale or a 7-point Likert scale, which varied for the different statements.

Lastly, a few demographics, age category, gender, game experience and game enjoyment, as well as if they work for the Port of Rotterdam or another business were asked in the survey. Besides the survey, observations are made during the gameplay and debriefing. This is needed to gain insight into why players had specific behaviors or to help explain results from the survey.

To ensure ethical standards and participant consent, informed consent was used. For the pre- and post-survey, the start page was used as an informed consent form, in which a short explanation was

given. For the experiment, all participants were given an informed consent form, which can be found in Appendix 6.

The location of all the game sessions was rooms in the office of the Port of Rotterdam in Rotterdam. It was not possible to book the same room for every session, but each room was equipped with a screen and had enough space for the participants.

The facilitator of all the game sessions was Thijme Lee, who is also the researcher of the thesis. His role in this research was to explain the game and facilitate the game and the debriefing. He tried to not influence the gameplay to give the players the chance to explore the game themselves.

4.3 Procedure

In Appendix 6, a time schedule can be found on which moments which actions are taken. The precise procedure for each of the activities is described here.

The first step of the experiment was to invite people to participate in this experiment. As mentioned, 158 people were invited to participate via mail. The participants were approached via the contacts of the Port of Rotterdam. First of all, employees of different companies in the Rotterdam port area were asked to join. Secondly, employees of the Port of Rotterdam were asked to join. In this e-mail, serious gaming was not yet mentioned. This choice was made to avoid selection bias, in which only people who liked gaming joined the experiment. It was mentioned that they could subscribe to one of the experiments and that the theme of the experiment was the tightness of the labor market. It was explicitly mentioned that the experiment was suitable for managers, HR employees or other employees who are interested in or involved in the labor market. Furthermore, it was mentioned that the experiment would take approximately 3 hours and would take place physically at the office of the Port of Rotterdam. In the e-mail, a link to a Google Form was given, where the participants could join one of the sessions. The moments of the sessions were decided on before the invitation.

On the 10th of May, the office rooms for the games were booked, based on the enrolment list so far. Every room booked needed to be sufficient for the game session. This meant that the rooms needed to accommodate the expected number of visitors and had a screen on which a PowerPoint could be shared. All office rooms were booked and physically inspected to make sure that the rooms would fit these criteria.

On the 15th of May, all participants who enrolled for one of the sessions got an invitation to join the session at the specific time they had chosen. All participants got an e-mail in which serious gaming was mentioned as the method used during the experiment. Furthermore, the specific time and location of the experiment were communicated to the players. It was also mentioned that they could expect a pre-survey soon. Lastly, all players were informed that they would receive a QR code to enter the office of the Port of Rotterdam if they were a visitor at the office of the Port of Rotterdam. One player was the only player that was subscribed for a specific time slot. She was invited to join one of the other time slots, but could unfortunately not make another session.

On the 18th of May, all participants received an e-mail with a link to the pre-survey of Qualtrics. All participants were asked to fill out the pre-survey. It was explicitly mentioned that they needed to fill out the form before participating in the experiment. The pre-survey started with an opening statement used for informed consent, which explained the goal and the risks of the experiments. The pre-survey informed consent form can be found in Appendix 2.

On the 19th of May, participants who were not employees of the Port of Rotterdam were enrolled in the system of the Port of Rotterdam that is used to enroll visitors. The name, mail address, time and goal of the visit was given. All guests got a QR code, which they needed to enter the building.

30 minutes before the start of every session, the game host prepared the game session. First of all, he placed enough consent forms with pens around the table. Next, the laptop was connected to the screen, which was needed to show the PowerPoint that was used for this experiment. This PowerPoint can also be found in Appendix 2. Lastly, the game was prepared by placing the different paper elements and coins next to the chair of the game host. This was needed to make the start of the game easier. However, the participants could likely not see all of the elements of the game yet, because of how the materials were placed. At the start of each session, all participants were welcomed into the room and were asked if they liked something to drink. Furthermore, they were asked to fill out the consent form for the experiment. Questions about the consent form were answered by the game host if this was needed. All consent forms were checked by the game host before starting the experiment. The consent form for the experiment can be found in Appendix 7.

Before playing the game, everyone was asked if they filled out the pre-survey. If not, the participants got the chance to fill this out by scanning the QR code, which was visible on the PowerPoint. All participants mentioned that they did fill out the pre-survey, so this QR code was not used.

The game host first introduced himself to the group, mentioning what study he did and his interest in serious games. After that, all participants were asked to introduce themselves. They were specifically asked to tell their job description, their employer and the reason they were present at the specific session. After the introduction, the game host briefly explained what serious gaming is and gave examples of how it can be used as a learning or research method. The game host now can explain the game. The full game description can be found in Chapter 3. The host explains the idea of a cat café. With bigger groups, teams of two or three players were made, in a way that there were three or four teams. For smaller groups, every player started their own cat café. It was explicitly mentioned that players needed to try to be open-minded during the gameplay. The goal mentioned was to start a successful cat café. What this success meant exactly was not mentioned. It was also explicitly mentioned that rules would be added during the gameplay. The rules were not fully explained before the start of the game but were introduced to them bit by bit.

During the gameplay, the host had multiple tasks to fulfil. First of all, the game host made notes on the behavior of the players such as outstanding behavior or the reaction of the players overall. Secondly, the game host needs to provide all players with the correct number of coins and bought attributes (such as food and wellness). The division and moving of the cats were also done by the game host. The gameplay was made in a way that some freedom could be taken by the game host, meaning that there were no precise rules for how cats needed to move or how money needed to be given away.

Furthermore, in a later stadium of the game, teams could think of their own action they wanted to take. The game host decided how much the costs of this action were and what the effect of the action was. The game host also tried to keep the players involved. When groups did not understand the game or were not sure what they were doing tips were given, such as 'try to discover why certain cats move'. Lastly, questions were answered by the game host. However, not all questions could be answered, because the game was designed in a way that encouraged the players to understand the rules of playing. Therefore, the host was hesitant to answer questions that were about how certain mechanics worked. When players asked if certain actions were possible, the game host tried to have an open mind and decided on the spot if this action would hinder the game experience. For example, the game host allowed players to sell a robot cat through to another café or to merge two cat cafés into one. Some photos of the set-up were taken after the game. The game was stopped when the game host estimated the players were done. The last round was announced to inform the players that this was their last chance to take action. After the gameplay, all players got a 10-minute break.

In the debriefing, the first question asked was the first reaction to the game. During the debriefing, the game was still. The game host tried not to steer the conversation too much. The game was not explained by the game host, but the players themselves could try to explain the game. If the players themselves did not understand certain elements of the game, the game host explained these specific elements. The link between the game and reality was made during these conversations. Lastly, the players were asked if they learnt anything from the gameplay.

After the debriefing, all players were asked to fill out the post-survey. This was done by providing a QR code on the PowerPoint, which could be scanned by their mobile phone. The Post-survey was made and distributed via Qualtrics. All participants were asked to fill out the post-survey directly after the debriefing, while still being in the room. The post-survey started with an informed consent page. No questions were answered about the Post-survey. After every player filled out the post-survey, all players were thanked for participating in the game. The full post-survey including the opening statement page can be found in Appendix 2.

After each session, the game was tidied up by the game host. The full game was collected in a plastic bag and all consent forms were put in a bag. After all game sessions, the data of the pre-survey and post-survey were matched via SPSS. The ID for all players was the last 4 digits of their phone number. The two surveys were merged into one SPSS file, which is used for data collection. When the research is finished, all data is deleted from Qualtrics and SPSS.

4.4 Data analysis strategies

For the data analysis, the data is converted from Qualtrics to SPSS. In SPSS, the data was cleaned and edited in the following way. First of all, two respondents responded with text to the question of how much work experience they had. This has been edited to the correct number. Secondly, based on the time they sent their post-survey, the variable sessionID is added, so it is known which session they joined.

As mentioned, this research uses both qualitative data and quantitative data.

First, some descriptive data is shown. In the appendix, a frequency table for all variables can be found. A table of descriptive data is shown, showing the demographics of age, sex, work, gameplay frequency, and gameplay enjoyment.

After this, the game experience is discussed. First, some observations are shared, which gives insight into how the sessions went and what stood out during the gameplay. The sessions are discussed and differences between sessions are mentioned. The goal here is to give an overall impression of the sessions and highlight peculiar actions or words. Most of the qualitative data are descriptions of actions or comments of the players. Qualitative data is also used to support or discuss quantitative data. In this research, quantitative data is mostly used to support or give context to the qualitative data. No specific data strategies are used for the qualitative data.

After this, the results of the components of the Game Experience Questionnaire, as mentioned in the materials, are discussed. The mean and outliers for the different components are evaluated. Other survey questions that are specifically asked to evaluate this game are also discussed. The results are presented in box plots and are discussed. In this way, the quality of the game and debriefing can be evaluated. The mean and outliers for the different components are discussed.

Next, a test for normality is done to decide if parametric can be used for this research or if it is necessary to use non-parametric tests. To test for normality the Shapiro-Wilk test is done. The Shapiro-Wilk test is chosen, because this test is known for its high sensitivity, specifically for cases with a small sample size, which is the case for this research. Furthermore, it is a widely used and accepted statistical test.

To test if there are differences between groups, such as age and sex, statistical tests are done. This is done for the groups' gender, age, gameplay frequency, gameplay experience, session group, and work (being a binary variable that indicates if employees work for the Port of Rotterdam or for another company). This is done to decide if the game is suitable for everyone or is unknowingly designed for a specific group. For the variables with only two groups, being gender and work in this case, the independent samples t-test or the Mann-Whitney U test can be used. If the variables are normally distributed, the independent t-test is used. If normality cannot be assumed, the Mann-Whitney U test is used. Both tests compare two independent groups to decide if the groups can be seen as equal. For the variables with more than two groups, age, gameplay frequency, gameplay experience, and session group, one-way ANOVA or The Kruskal-Wallis test is used. Again, in the case that the groups are normally distributed, one-way ANOVA is used. Otherwise, the Kruskal-Wallis test is a good alternative to test if there is a difference between groups for the different variables.

Next, the different factors for gaming that were designed under materials need evaluation. This is done by component factor analysis of the variables of the pre-survey, with a fixed number of factors of 6. Varimax rotation is used, which maximizes the variance. If the component factor analysis shows factors that are based on the same variables as designed, the factors can be used for further analysis. Otherwise, the individual variables are used for further analysis.

To discuss the vision of the players in the labor market, first, some general descriptive data are discussed, such as the mean for specific factors or individual variables. Most importantly, the pre-and post-survey are compared. This is done by using a paired t-test or a Wilcoxon signed-rank test. Both are used to compare if there is a significant difference between two paired observations. The paired t-test can be used for normally distributed variables. If the variables are not normally distributed, the Wilcoxon signed-rank test can be used. Depending on the component factor analysis, one of these tests is used on the factors or on the individual variables.

Chapter 5: Results

In this chapter, the results of the experiment are presented. The pre-survey and post-survey are analyzed, in combination with the physical observations that were made during the game. This chapter oughts to answer the question:

What are the qualitative and quantitative results of the experiment?

First, the observations of the game sessions are discussed. Secondly, descriptive statistics are presented. After that, group differences are discussed. Lastly, the survey about Secondly, the respondent group will be analyzed. Lastly, the view on the labor market is discussed.

5.1 Descriptive Statistics

In total, there were 26 responses to the pre-survey and 25 responses to the post-survey. Unfortunately, not all pre-survey responses could be matched to a post-survey response. Furthermore, not all responses were completed. The full histograms for all variables can be found in Appendix 10. All survey questions can be found in Appendix 2.

5.1.1 Demographics

In Table 3, you see the demographics of the participants of the game. First of all, women are represented more than men. The respondents are both from the Port of Rotterdam, but also from companies active in the port area of Rotterdam.

When looking at the age of the respondents, the age group 18-29, 30-39, 40,49 and 50-59 is represented. The respondents are from the Port of Rotterdam (N=13) and different companies active in the port area of Rotterdam (N=12). Overall, the respondents are positive about playing games, with only 4 respondents with a negative attitude towards gameplay. Most of the players play games at least a few times a year.

Table 3: demographics of participants

variable	answer options	Frequency
Sex	Woman	19
	Men	6
Age	<18	0
	18-29	5
	30-39	6
	40-49	8
	50-59	6
	60-69	0
	70>	0
Work	Port of Rotterdam	13
	Not port of Rotterdam	12
Game Experience	(Almost) never	5
	A few times a year	10
	Monthly	5
	Weakly	5
	Daily	0
Game enjoyment	Very fun	11
	A bit fun	10
	not that fun	4
	Totally not fun	0

5.1.2 Game experience

The session groups varied from 2 to 10 players. In total, 25 players took part in this experiment. 4 sessions were held, which will be referenced from session 1 to session 4.

Sessions 1 and 4 had a smaller group of players. For session 1, four players took part in the session. For session 4, only two players took part in the game. To improve the gameplay for this session, the facilitator played along.

The impression of the game sessions differs much per game session. Session 1 and 4 were enthusiastic from the start and the players understood the mechanics of the game quite fast. For session 2, a lot more resistance was shown when the game-play started. It appeared that some of these players did not see playing a game as a useful interaction. After the second round, the game facilitator urged the players to play the game more seriously and try to understand the mechanics of the game better. After this intervention by the facilitator, a more serious approach by most of the players was seen. One player even made notes of all the movements happening. One player seemed to give up the game as that player and kept having a hard time taking the game seriously.

In session 3, during the explanation of the game, some players seemed confused about why this was useful to discuss the labor market. However, they were open to playing the game and trying to figure it out. In comparison with sessions 1 and 4, this group had a harder time of understanding the mechanics of the game. This became also clear in the debriefing, in which the rules of the game were not fully understood. However, after explaining the game, the players thought it did make sense.

Not only was there a big difference in understanding the game between the sessions but also between the teams that played the game. For example, in sessions 2 and 3, two teams clearly were way more successful than the two other teams in that session. It seems like this is correlated with the attitude of the players. The players who were more willing to take the game seriously also were the players who became more successful in the game. However, in sessions where all players were fanatic about the game, the differences between the teams were less.

One goal that some teams added for themselves was to get diversity in the colour of cats, even though this was never mentioned by the game facilitator. Some teams even made it their priority to get other colors of cats. For example, in session 3, one team had a lot of black and white cats and decided their next action on how they thought they could attract other cats.

In All sessions, the idea of the different cats being in different age groups was mentioned. This was also never mentioned by the game facilitator or designed in that specific way.

In two sessions, sessions 1 and 4, working together or becoming one cat café with two teams was mentioned. The game facilitator allowed this, but in the end, this did not happen. What did happen in session 4 is that one team sold their robot cat to another team. This was also allowed by the facilitator.

In the debriefing, the game was talked about shortly, but the focus shifted to the labor market easily. The game was sometimes used to explain something. Many different aspects of the tight labor market were discussed, such as collaboration between companies, education of employees, competition on

salary, change in the mindset of employees, generational differences, automation, diversity and making your business attractive for new employees.

When asked if they learnt something from the experiment, most players mentioned that it did not specifically teach them anything new, but did remind them of elements that are important for them.

Overall, the experience differed quite a lot per session, per team and even per person. Some players were way more open-minded than others when it came to serious gaming. It seems like enthusiastic players were more successful in the game on average.

Besides the observations made, data about the game experience is collected. In figure 3, the boxplots are visible for the seven-game experience components. The two cases that struggled the most with engaging with the game were also in groups that had a harder time engaging with the game, which might be the reason that these players felt more tension. Overall, the game is regarded as quite challenging, with a mean of 4.75 (SD=0.95).

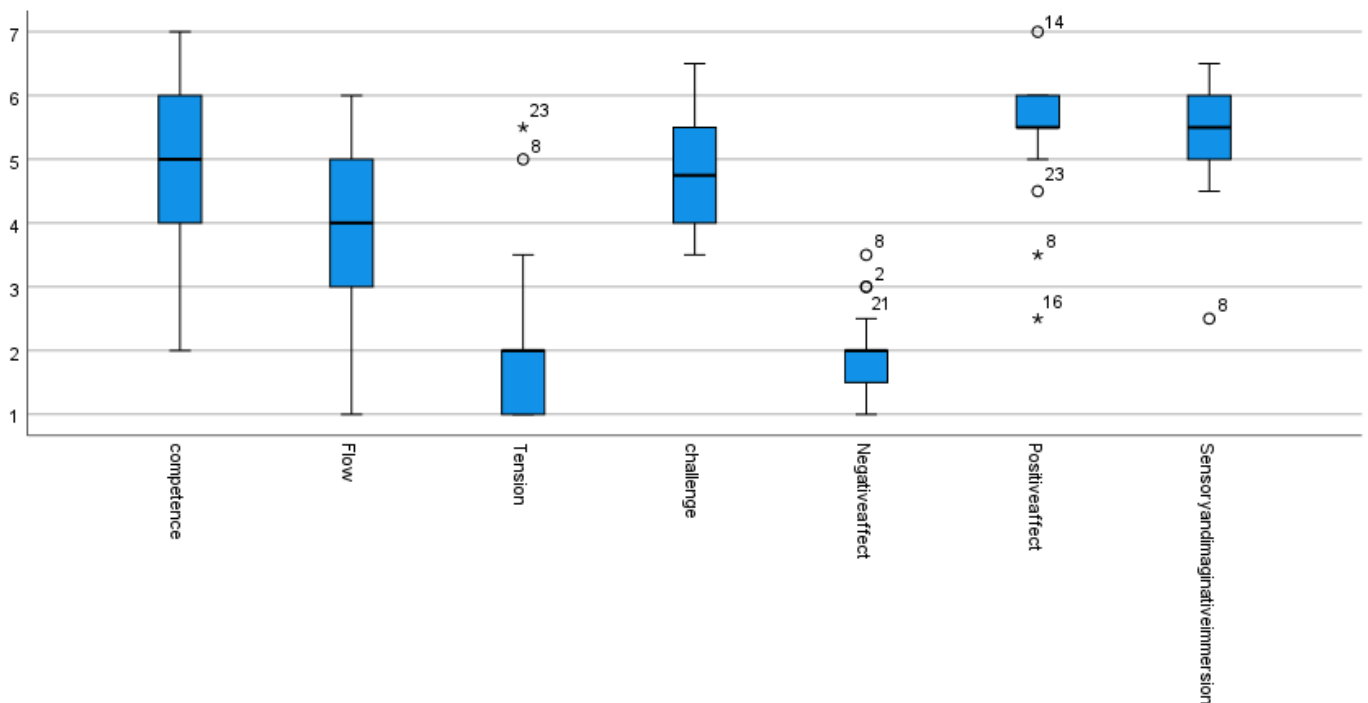


figure 3: Boxplots of game-experience components

First of all, we see that most players felt competent during the gameplay, but it is also visible that there is some variation between the players when it comes to how competent they felt during the game.

The mean of the Flow is 3.86 (SD=1.38). The two statements that determine the flow are about forgetting the surroundings and being totally absorbed in the game. When looking at the observations it is understandable that this game did not score higher on the flow. The game was played in an office meeting room and the game was not particularly designed to be completely lost in.

The tension was regarded as low, with a mean of only 2.09 (SD-1.2). Only two respondents have a positive score on tension, indicating that there was not a lot of tension while playing the game. The two outliers for this component are both players that played in session 2. This was also the group that had the most struggle with embracing the serious game.

The boxplots of the components' negative affect and positive affect are analyzed. shows that the gameplay resulted in mainly positive feelings by the respondents. All the negative outliers for positive affect are again respondents that joined session 2. This is in line with the observation that session 2 had more struggles with getting into the game.

In Figures 3 and 4, it is visible that the game got positive feedback overall on aspects such as the understandability of the game and the correct representation of the game.

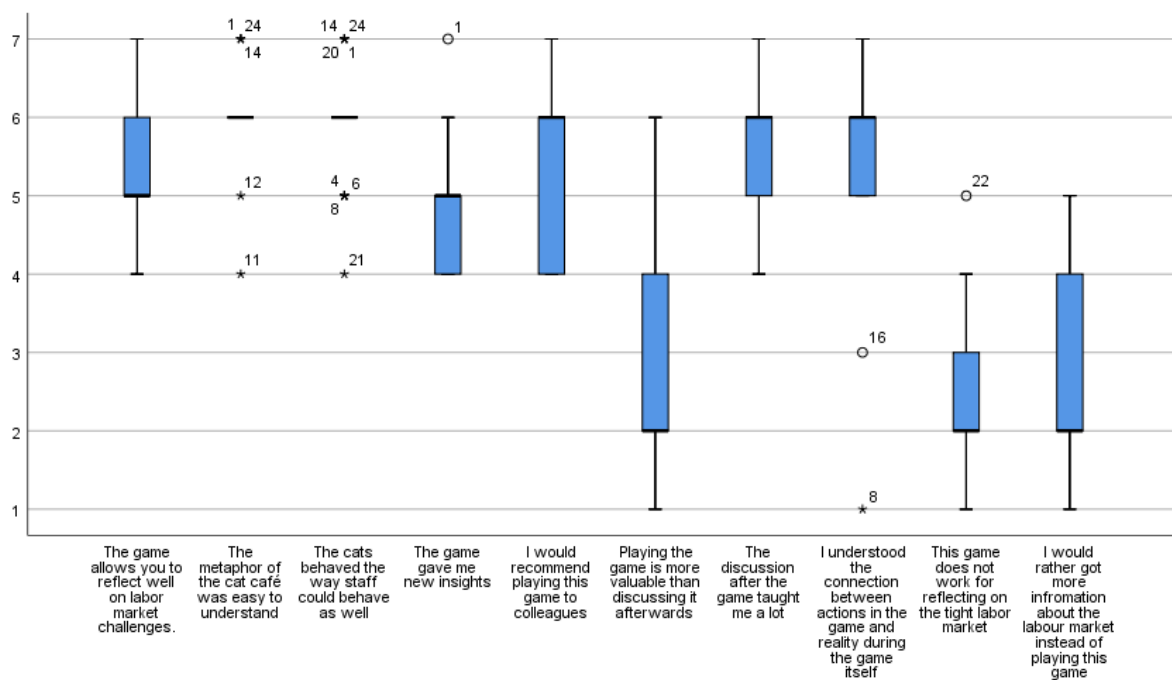


Figure 4: Boxplots of statements for feedback on the experiment 1

Overall, we see that the game session and the game itself were perceived as positive. all statements were answered in the desired direction, indicating that the game itself was designed satisfactorily for the goal of the game. One finding was that the mean score for the statement 'Playing the game is more valuable than the debriefing' was 2.91 (SD = 1.60) on a 7-point Likert scale, indicating that the debriefing was perceived as more valuable than the game itself. Furthermore, it is interesting to see that respondents 1, 14, and 24 are outliers when it comes to the question if the metaphor was understandable and if cats behaved the same way as employees. It needs to be noticed that these respondents are all coming from the smaller sessions 1 and 4.

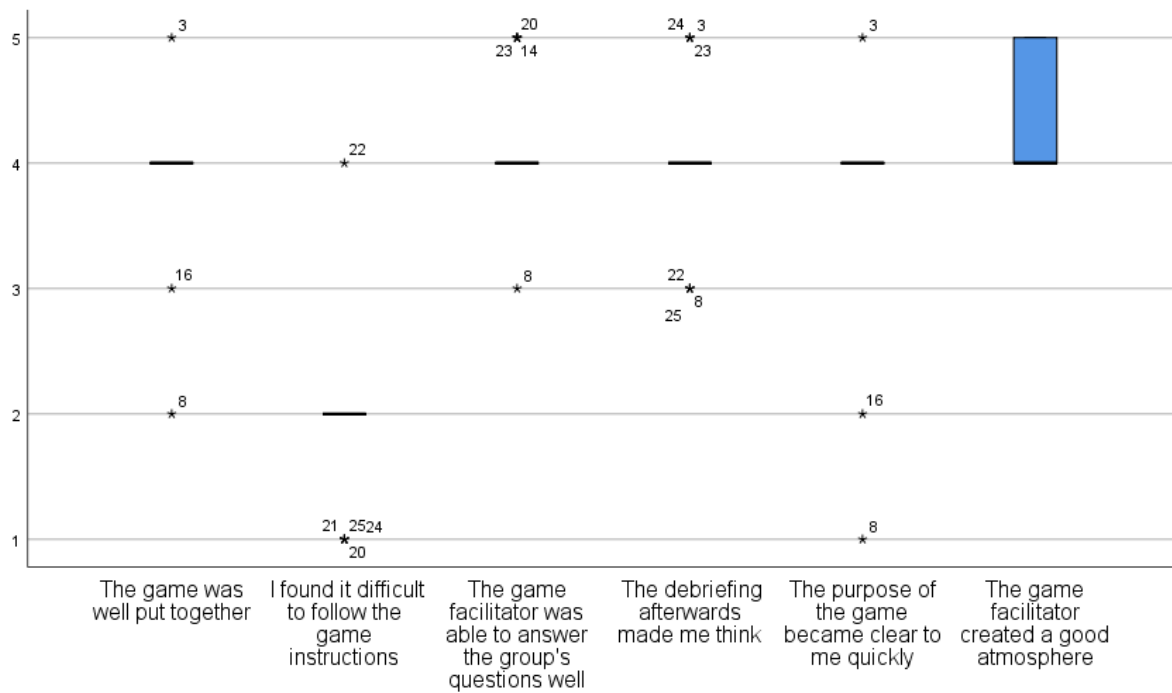


Figure 5: Boxplots of statements for feedback on the experiment 2

5.1.3 Quality of data

In Appendix 9, a test of normality can be found. This is needed, because if normality is not assumed, other, less strong, statistical tests need to be used. For many different variables, the hypothesis that the variable is normally distributed is violated. This means that Normality cannot be assumed for most variables. Many statistical tests, such as t-tests or ANOVA assume normality. Therefore, non-parametric tests need to be used for this research.

5.2 Group differences

To see if the game has the same results across different demographics, a Kruskal-Wallis H test is used for the demographic variables with 3 or more groups. For demographic variables with only two groups, the Mann-Whitney U test is used. Overall, some differences are found between groups, but many variables were taken into account.

for the group differences, we see that there are no statistically significant differences in gameplay enjoyment. For the other factors, gender, age, gameplay frequency, experiment group, and employer, a few statements have shown a difference. All significant differences can be found in Appendix 8. One notable finding for gender was that there is a difference between men and women when it comes to their estimated influence in the pre-and post-survey.

Overall, a few statements show differences, but overall, most statements do not show differences for the different factors. This indicates that overall, the effect of the difference in groups is minimal.

5.3 Attitude towards the labor market

Now the attitude towards the labor market is evaluated. This is done by analyzing the different categories of view of the labor market. Any significant differences between the pre-and post-survey could indicate that the game-mediated persuasive strategy worked. In the conclusions in Chapter 6, this will be further analyzed if this effect can be defined as a game-mediated persuasive strategy.

5.3.1 Analysis of factors for the labor market

As seen in the methodology, different statements are used to form variables. In Table 4, the factor analysis for the pre-survey is presented.

Table 4: factor analysis of the statements

	Component					
Statement	1	2	3	4	5	6
There is labor market scarcity in the port sector	0.129	0.838	0.078	0.205	-0.122	0.043
It is easy to fill job vacancies in the port sector	-0.117	0.895	-0.093	-0.077	-0.092	0.158
The labor market in the port sector will naturally become more favorable again	-0.115	-0.806	0.122	-0.061	0.125	0.023
I am aware of labor market issues	0.223	0.228	-0.142	0.749	-0.331	0.040
I have little knowledge about the labor market	-0.623	0.031	-0.253	0.222	0.147	-0.495
I am aware of new developments in the labor market	0.760	0.024	-0.056	0.368	-0.157	0.014
The company I work for is taking the right actions to deal with the current labor market	0.845	0.181	0.001	-0.025	0.029	0.023
The company I work for has a lot of knowledge about the labor market	0.311	0.163	0.641	0.263	0.248	0.315
The company I work for needs to do more to retain enough staff	-0.470	0.385	0.444	0.221	0.289	0.057
Competition with other companies becomes tougher during labor market scarcity	-0.067	0.075	0.144	0.808	-0.104	-0.176
Collaboration between companies is important during labor market scarcity	0.265	0.263	-0.086	0.575	0.219	0.457
We should provide more transparency to other companies about our recruitment policy	0.143	-0.266	-0.603	0.221	0.289	0.057

I can teach my direct colleagues something about the labor market	0.658	0.471	-0.258	0.099	-0.005	-0.004
I have little influence on my company's strategy regarding the labor market	-0.831	-0.167	0.275	-0.105	0.124	0.247
My company needs me to solve problems caused by labor market scarcity	0.186	0.543	-0.022	-0.051	-0.214	-0.559
Work environment is an important reason for employees in shortage to change jobs	-0.150	-0.185	0.090	-0.131	0.786	-0.180
Salary is an important reason for employees in shortage to change jobs	-0.402	-0.052	0.743	-0.079	-0.027	0.091
More challenges at another company are an important reason for employees in shortage to change jobs	-0.034	0.006	-0.121	-0.106	0.881	0.067
Opportunities for education are an important reason for employees in shortage to change jobs	-0.016	-0.256	0.821	0.058	0.047	-0.106
The port sector as a whole has a strong position in personnel recruitment	-0.083	-0.177	0.011	-0.112	-0.184	0.866
The port sector as a whole is facing issues due to labor market scarcity	0.060	0.544	-0.078	0.435	-0.023	-0.282

This table shows that the variables as defined in the method section, cannot be supported by the factor analysis. Some variables a high influence on the factors, but the factor analysis does not show a clear distinction between the six variables in the way they were designed. Therefore, it is not possible to use the factors to analyze the pre-and post-survey.

5.3.2 Analysis of the Labor Market

Overall, we see that the respondents are aware of the tight labor market. On the variable tightness, the mean for the pre-survey is 5.36 (SD=1.05) on a 7-point Likert scale, meaning that they are aware of the current tightness. They also feel confident in the pre-survey about their knowledge of the labor market and their individual influence on the strategy of their company, with a mean for Knowledge of 5.33 (SD=0.82) on a 7-point Likert scale and a mean for Influence of 4.65 (SD=1.34) on a 7-point Likert scale.

The position of their own business in the current labor market is generally viewed as positive with a mean of 4.56 (SD=7.8) on a 7-point Likert scale in the pre-survey. However, the position of the Port sector is regarded as more negative in the pre-survey with a mean of 3.19 (SD=1.03) on a 7-point Likert scale. We see that most respondents think that companies should work more together to handle the labor shortages right now. In the pre-survey, the mean of collaboration is 5.17 (SD=0.89) on a 7-point Likert scale. Only one respondent has a slightly negative view of collaboration between companies.

The different factors on which employees who are hard to find might consider working for another employer are all regarded as important. These variables are the work ambience with a mean of 5.58

(SD=1.1), Salary with a mean of 5.46 (SD=1.25), a more challenging job with a mean of 5.79 (SD=0.87), and options to education with a mean of 5.58 (SD=0.776). All these variables are on a 7-point Likert scale.

The different statements about the labor market of the pre-and post-survey are analyzed, which can be seen in Table 5. The hypothesis for this comparison is the following:

There is a change of view on the labor market and on the player's own influence on the labor market between the pre-and post-survey.

Table 5: Pre- and post-survey comparison on view on the labor market

Statement	Pre-median	Post-median	Z-value	P-value
There is labor market scarcity in the port sector.	6	6.5	-2.333	0.020*
It is easy to fill job vacancies in the port sector.	3	2	-1.386	0.166
The labor market in the port sector will naturally become more favorable again.	2.5	3	-0.733	0.464
I am aware of labor market issues.	6	6	-0.837	0.403
I have little knowledge about the labor market.	2	2	-1.731	0.083
I am aware of new developments in the labor market.	5	5	-1.508	0.132
The company I work for is taking the right actions to deal with the current labor market.	5	5	-1.403	0.161
The company I work for has a lot of knowledge about the labor market.	6	6	-0.857	0.391
The company I work for needs to do more to retain enough staff.	5	5	-0.568	0.570
Competition with other companies becomes tougher during labor market scarcity.	6	6	-0.378	0.705
Collaboration between companies is important during labor market scarcity.	6	6	-1.890	0.059
We should provide more transparency to other companies about our recruitment policy.	4.5	5	-1.805	0.071
I can teach my direct colleagues something about the labor market.	5	6	-1.809	0.070
I have little influence on my company's strategy regarding the labor market.	3	3	-1.098	0.272
My company needs me to solve problems caused by labor market scarcity.	5	5	-0.722	0.470
Work environment is an important reason for employees in shortage to change jobs.	6	6	-2.066	0.039*
Salary is an important reason for employees in shortage to change jobs.	6	6	-1.294	0.196
More challenges at another company are an important reason for employees in shortage to change jobs.	6	6	-1.035	0.301
Opportunities for education are an important reason for employees in shortage to change jobs.	6	6	-1.200	0.230
The port sector as a whole has a strong position in personnel recruitment.	4	4	-0.263	0.793
The port sector as a whole is facing issues due to labor market scarcity.	6	6	-0.749	0.454

* Indicates a p-value <0.05

For two statements, a significant difference is found. For the first statement, After the experiment,

the labor market is considered tighter by the players of the game. The second statement with a significant difference is 'The atmosphere is an important factor for employees to change jobs'. The atmosphere is seen as more important after playing the game.

Another statement, that is not related to the factors but is asked for controlling what is considered important by the respondents. The statement '*The atmosphere is an important factor for employees to change jobs*' has a significant increase between the pre-survey and post-survey, $W=-2.07$ $P=0.04$.

When looking at the hypothesis: *There is a change of view on the labor market and on the player's own influence on the labor market between the pre-and post-survey*, it can be concluded that this hypothesis can be accepted, as two variables have shown a significant difference between the pre- and post-survey.

Chapter 6: Discussion

In this chapter, the results of chapter five are discussed and the most important findings are focused on. Furthermore, strengths and limitations are discussed. Lastly, the implications are discussed and recommendations for future research are given.

6.1 Key results

In this research, criteria are decided on for reflecting on persuasive games for multi-actor systems problems, a game is designed and an experiment is designed and executed. The key results of these different elements discussed in this paper

Criteria

Firstly, we will focus on the criteria that were designed for this project. The "5C" criteria proposed by Duke and Geurts (2004) serve as a foundation for evaluating game-mediated persuasive strategies for multi-actor systems, because these criteria specifically focus on serious gaming for multi-actor systems. The criteria that resulted from this are Understanding Complexity, Improving Communication, Stimulating Creativity, Consensus Building, and Commitment to Action. For example, the criterion of Understanding Complexity emphasizes that the game should enhance participants' understanding of the multi-actor system problem, whether through a realistic representation or metaphorical approach. Similarly, the criterion of Improving Communication highlights the importance of facilitating effective communication among participants, allowing the exchange of ideas and viewpoints related to the problem. Stimulating Creativity and Consensus Building are needed to reach agreement among diverse stakeholders, with possibly creative solutions. Lastly, the Commitment to Action criterion emphasizes the game's role in motivating participants to apply the insights from the game to the real-world, thereby driving behavioral change.

Two further criteria were added, being emergence and immersion. This was based on Mayer et. al. (2008), who claims that emergence and immersion both play an important role in games for multi-actor systems. Mayer (2008) explains emergence in real-life and in games as 'a limited set of elements and rules can lead to an (almost) infinite number of outcomes'. This can be seen in for example chess. How exactly a game works or can be played is not just known by reading the rules, but can only be learned by playing the game. If a real-life situation is simulated using serious games, it is possible that the same emergence can be found in the game as in real life.

Another important factor is immersion. However, when looking for an exact definition of immersion for serious games, there is again not a definition that is broadly agreed on. In this paper, we use the suggestion of Jennett et. al. (2008), that immersion has to do with flow, cognitive absorption, and presence. In total, these seven criteria, Complexity, Improving Communication, Stimulating Creativity, Consensus Building, and Commitment to Action, Emergence and Immersion, were set up to review specifically persuasive games for multi-actor systems without a prescriptive message in the game. These criteria could be used for future research into the subject of persuasive gaming for multi-actor system problems.

Game design

After deciding on the criteria, a game design for the case study on the tight labor market in the Port of Rotterdam is made. This game uses the metaphor of a cat café that focuses on getting cats, representing employees, in this cafe. The gameplay aims to illustrate the challenges and dynamics of the labor market by symbolically representing various aspects of the labor market and employment through the cats and their interactions within the café. The following parts of the game provide a short summary of the game design. The full game design can be found in chapter three.

Game Objective: Players are tasked with starting a successful cat café in a city with cats. The primary goal is to attract cats to the café while managing resources and making strategic decisions.

Game Setup: Players form teams or play individually and brainstorm café names and slogans. Each team starts with 5 coins, which they can use to purchase items that attract cats, such as cat food, toys, robot cats, and wellness days. Different-colored cats represent different priorities of the cats: black for salary, white for sphere, and yellow for education. Brown is used as a wild card to maintain the game balance.

Rounds and Actions: The game progresses through rounds, with players using their coins to make decisions. Cats symbolize employees, and the actions simulate attracting employees, leisure activities, automation, and salary.

Cat Dynamics: Over rounds, cats may migrate between cafés based on players' decisions, reflecting labor market movements. Custom actions can be introduced, influencing cat migration based on logical connections. Players need to adapt their strategies as the labor market (represented by the cats) becomes tighter, reflecting real-world challenges.

Final Round and Conclusion: The game concludes with a final round where players can use the remaining coins to attract cats. The game's focus is on understanding the labor market dynamics and the complex interplay of decisions rather than declaring a winner.

This game design provides a way to explore the tight labor market in the Port of Rotterdam. It enables players to think about what the different cats, representing employees need. The symbolic representation of labor-related concepts through the cats adds a distance between the real problems, with the goal of letting the players explore more and be more daring than in real life. Most importantly, this game design is not designed with a prescriptive message embedded in the game. This gives players the chance to come up with their own solutions and conclusions, independent of the game.

Experiment design

The experiment design for this research consists of the following components:

Participants: Participants were recruited from the Port of Rotterdam and were employees of the Port of Rotterdam or other companies within the Port area. A total of 158 participants were invited to take part in the experiment, and they were divided into four sessions with varying numbers of participants per session (2 to 10 participants). Participants provided informed consent and agreed to participate without any rewards other than the results of the research.

Materials: The experiment utilized the following materials:

- A paper-based game called "Cat café" (designed as described in Chapter 3).
- A PowerPoint presentation (Appendix 2) used to guide the experiment and explain the game.
- Pre- and post-surveys distributed via Qualtrics, containing statements and questions related to the labor market, game experience, and demographics (Appendix 3).
- Notes of observations made during gameplay and debriefing.
- Informed consent documents (Appendix 6).
- Location: Rooms in the office of the Port of Rotterdam.
- Facilitator: Thijme Lee, the researcher, also explained the game and facilitated the sessions.

Procedure: The experiment procedure included the following steps:

- Inviting participants via email and providing them with a Google Form to enroll in one of the sessions.
- Booking office rooms for the game sessions and preparing the materials.
- Welcoming participants, collecting informed consent forms, and explaining the game.
- Conducting the gameplay, which involved gradually revealing game rules, distributing cat cards and attributes, and facilitating cat movements and actions.
- Debriefing participants after the gameplay to discuss their reactions, understanding, and learning experiences from the game.
- Participants filled out the post-survey immediately after the debriefing, using a QR code provided in the PowerPoint.
- Matching pre-survey and post-survey data using participant IDs.
- Analyzing the data in SPSS, including descriptive statistics, tests for normality, comparing groups, and conducting component factor analysis.

Data Analysis Strategies: The data analysis included the following steps:

- Descriptive statistics: Analyzing demographics and game experience components.
- Qualitative data analysis: Discussing observations made during gameplay and debriefing, highlighting notable actions and comments.
- Component factor analysis: Evaluating the factors designed for the game, using variables from the pre-survey, through SPSS with varimax rotation.

- Comparing participants' views on the labor market: Comparing pre-survey and post-survey responses using paired t-tests or Wilcoxon signed-rank tests, depending on data distribution.
- Comparing groups: Using independent t-tests or Mann-Whitney U tests for variables with two groups and one-way ANOVA or Kruskal-Wallis tests for variables with more than two groups.

The overall research design aimed to investigate the effectiveness of the serious game in influencing participants' views on the labor market and their game experience.

Experiment results

The study garnered responses from 26 participants in the pre-survey and 25 in the post-survey. Among the participants, a higher proportion were women (19) than men (6). They represented both the Port of Rotterdam and various companies within the port area. The age of the players ranged from 18 to 59. Most participants, participants were positive toward playing games, with only a limited number expressing a negative attitude. The majority reported engaging in gaming several times annually.

Across the four sessions, involving a total of 25 players, the participants' engagement with the game revealed a range of experiences. Sessions 1 and 4 were characterized by enthusiastic participation, with players quickly understanding the game mechanics. However, session 2 faced initial resistance, potentially due to scepticism regarding the game's utility. After an intervention this resistance reduced. In session 3, the players took a bit longer to understand the game mechanics in comparison to sessions 1 and 4 but did understand the idea of the game afterwards. Notably, players' seriousness and commitment impacted their success within the game based on the observations. Variances in understanding the game mechanics emerged between sessions and teams, influencing outcomes and overall engagement levels.

While most players felt competent during gameplay, variations were observed in their reported competency levels. The "Flow" component, which gauges players' immersion in the game, scored lower due to the office setting's constraints. Low levels of tension were reported, with session 2 participants indicating higher tension. The game's overall challenge was rated favorably. Furthermore, participants generally reported positive feelings after gameplay, although session 2 exhibited more struggles. An outlier experience was observed in respondent 8, who scored more negatively on many of the gameplay components. Feedback regarding the game session and overall experience was positive. Notably, the debriefing was deemed more valuable than the game itself, suggesting that post-game discussions had a significant impact.

To review the data quality, a normality test was taken. Given the violations of normality assumptions across multiple variables, non-parametric tests were deemed appropriate for subsequent analyses.

Diverse demographic groups were subjected to Kruskal-Wallis H and Mann-Whitney U tests to uncover group differences. Importantly, no statistically significant distinctions were detected in terms of gameplay enjoyment. While some statements displayed differences across gender, age, gameplay frequency, experiment group, and employer, these variations were generally minor, implying that the impact of demographic differences on outcomes was limited.

Significant changes were observed in two key statements between the pre- and post-surveys. Participants indicated a heightened perception of the labor market's tightness after engaging in the game. Furthermore, the importance of atmosphere as a factor influencing job changes was higher after the gameplay.

The ensuing discussion section will delve into the implications of these key results, their alignment with existing literature, and the broader significance of the findings in the context of addressing labor market challenges.

The experiment aimed to investigate the potential of a game-mediated persuasive strategy for addressing multi-actor systems problems. The quantitative data revealed a change in attitude towards certain statements, particularly regarding the recognition of a tight labor market and the significance of the work atmosphere in influencing job changes. It's important to note that while these changes suggest a possible impact of the game-mediated persuasive strategy, alternative explanations exist.

The emergence of collaboration as a theme across all sessions is a notable finding, mainly because collaboration was not actively a theme of the game, which suggests this outcome aligns with the goal of the game-mediated approach, where persuasion arises from the players themselves. While the significance of attitude change in the two statements mentioned earlier may not solely be attributed to the game-mediated strategy, the consistent emergence of collaboration suggests a positive influence of the strategy on multi-actor systems. Furthermore, the game's freedom of players and players resulted in diverse gameplay ideas, such as associating different colored cats with various age groups.

Despite these promising findings, several limitations need consideration. The small participant pool and potential bias due to the researcher's role as both game designer and analyst could impact the generalizability of the results. Additionally, the study focused on a specific multi-actor system.

In conclusion, the results suggest that a game-mediated persuasive strategy has the potential to influence attitudes and encourage collaboration within multi-actor systems. While the specific attitude changes observed may have other explanations, the emergence of collaboration as a theme supports the strategy's effectiveness. Further research with larger and more diverse samples, as well as in different multi-actor contexts, is recommended to validate and generalize these findings.

6.2 Interpretations of the experimental results

In this chapter, the experimental results discussed in Chapter 5 are interpreted. This is done by using the criteria for a game-mediated persuasive strategy. For each of the criteria, the results of the experiment that are connected to that criteria are discussed.

Understanding complexity: The study revealed a nuanced outcome regarding participants' understanding of labor market complexity. While players reported comprehending the game, there was no significant difference in statements related to knowledge of the tight labor market between the pre-and post-survey. The results suggest that the game acted more as a reminder of existing knowledge rather than providing new insights. This could be supported by the fact that there is a significant difference in the statement 'There is tightness on the labor market', which was more agreed upon after the game session. This could mean that one of the effects of the game can be explained as creating more awareness. It is possible that this game has a bigger role in teaching people the complexity of the problem for other groups, as most participants of this experiment were already informed about the current tight labor market. In essence, participants already possessed a high level of understanding of labor market complexity, and the game served as a reinforcement of their existing knowledge for this group.

Improving communication: For this criterion, we can conclude that the game session had a positive effect on communication. First, the game session alone made people come together from different companies that were all struggling with the tightness of the labor market. The session brought back different companies who otherwise would be not likely to talk together about this subject. Moreover, the intention to collaborate and work together more closely with other companies was mentioned during every session. This game session could be the start of more collaboration between the companies. Lastly, the debriefing, in which communication about the tight labor market was central, was highly regarded. It can be concluded that this session helped with improving the communication, specifically between parties that were less likely to meet if the game session had not taken place. The challenge for the participants is to keep this communication between the different companies happening.

Consensus Building:

While consensus existed regarding the acknowledgment of the tight labor market challenge, the study found that there is not one specific solution that is generally agreed on. . It appears that the game did not lead to immediate alignment on actionable strategies. However, a shared consensus emerged around the need for enhanced collaboration, despite differing perspectives on other aspects. This consensus-building effect suggests that the game successfully highlighted the importance of collaboration in addressing labor market issues. The collaboration between companies is not yet happening, suggesting that this consensus for the need of collaboration is supported by the game session.

Stimulating creativity:

The game design was focused on supporting the creativity of players, which happened during and after the game. First of all, the participants were allowed to design their own actions within the game, meaning that they could be creative in that. However, this was part of the steps of the game. However, possibly because of the free character of the game, other ideas also were discussed, such as merging two businesses or buying from each other companies. Overall, it can be concluded that this game helped with creative thinking.

Commitment to Action:

Given the participants' pre-existing interest in the labor market issue, the study did not reveal a substantial shift in commitment to action. However, participants expressed uncertainty about the specific actions required to tackle the labor market challenges. The need for more collaboration was discussed, so even though companies might still be unsure which specific actions to take, the commitment to collaborate more is also a new form of commitment to action which was enhanced by this game.

Emergence: When looking at the gameplay and the way of hosting the game, it can be said that emergence took place. For example, players were allowed to create their own actions, on which the game facilitator improvised the exact outcome. However, this element was already designed in the game. Even more convincing is actions that were allowed by the facilitator such as buying from other companies. In two sessions, merging two of the cafés was mentioned. This kind of action was certainly not designed in the game but was allowed. It can be concluded that emergence was certainly part of the game.

Immersion: The last criterion, immersion, is also fulfilled. In the Game Experience Questionnaire, we see that immersion scored high on average, showing that the players felt immersion.

It can be concluded that there are no criteria that are not met. Some criteria might be more convincingly met than others, but there is not one criterion that failed completely to be met.

Most notable for this research is the arising of the subject of collaboration during and after the game for each of the sessions. This is especially interesting because there is no element in the game session that encourages the idea of collaboration between the companies in the game or outside the game. This makes it highly likely that this subject arises from the ideas of the players, which is exactly what the idea of game-mediated persuasive strategy entails. This might be a positive sign that a persuasive game without an intended behavioral change can result in a desired common change for players, in this case, more collaboration. This also gives the Port of Rotterdam a suggested direction to what the focus can be to handle the tight labor market, while facilitating more collaboration between the different companies.

It needs to be noted that the experiment is done in four different groups. Because of the idea of game-mediated persuasive strategies that the persuasion comes from the players themselves, it is possible that every group had different attitude changes, which are hard to pick up on. However, because of the research setup and the relatively small groups, these changes within specific groups are hard to measure.

Furthermore, it is important to notice that the overall reaction of players to the game and the experiment was positive. This is an important note because when the game is not seen as positive, the effect of the game is likely also not positive.

6.3 Implications

The findings of this study suggest the potential of game-mediated persuasive strategies in addressing multi-actor systems problems, which seems unexplored in current literature. Current persuasive games often convey specific messages, such as anti-smoking campaigns, which are often not fitting in multi-actor systems. This research explored an alternative method, investigating the options of persuasion without explicitly embedding the message within the game design. Although the generalizability of these findings to all multi-actor systems requires caution, the outcomes are promising and underscore the need for further investigation in this domain.

The prevalent approach of incorporating direct messages in persuasive games might not align with the complexities of multi-actor systems. Instead, this study ventured to explore strategies that enable persuasion without dictating behaviors within the game. The absence of research in this area suggests a gap in understanding how game-mediated persuasion can help with multi-actor problems.

While this study shows the potential of game-mediated persuasive strategies for multi-actor systems, it refrains from making claims about their universal applicability. The results indicate that such strategies can induce meaningful shifts in attitude and behavior, as evidenced by the emergence of collaboration as a step toward the solution. While the current findings are meaningful in this case it needs to be noticed that this is only the first exploration of this topic. Future research should explore various multi-actor systems to see the effect in different domains. This study can be used as a basis for future studies in this domain.

In conclusion, the findings of this explorative research provide a first look into the potential of game-mediated persuasive strategies for multi-actor systems. While the approach departs from traditional methods used for persuasive gaming and requires further investigation, the outcomes suggest a viable for inducing collaboration, consensus building, and creative thinking for multi-actor systems problems. The first exploration is promising and this new approach to persuasive gaming deserves more research.

6.4 Limitations

While the study shows the potential of a new approach to persuasive gaming, some limitations of the study need to be addressed.

First of all, the game designer and the researcher of this research are the same. This could lead to some bias while interpreting the results. The researcher has tried to stay objective while reviewing the results, but it needs mentioning.

Furthermore, the sample size of the study was small, meaning that it is hard to say if the results are generalizable. A bigger test group is needed to make sure that the results are generalizable to the population. Besides the group population, some changes between groups are also found. For example, men estimate that their influence on the strategy of their company with regard to the labor market is bigger. These group differences can be researched more with a bigger sample set. It is advised to repeat the same sort of research but with a bigger sample set. Which could help with generalizing these results.

Another challenge for a game design with no message embedded in the game is that it is hard to completely refrain from putting some unintended message in the game. This means that unintentionally it could have happened that a certain aspect of the game had an unintended persuasive effect. However, for collaboration, it seems not likely that it happened because of the game, as this was in no way part of the game.

The criteria that were designed in Chapter Two could have taken a more prominent role in the questionnaire. Now, the criteria can be used for evaluating the game, but more correlation between the designed criteria, the game design, and the research design would have improved the paper.

Next, the effect of the game was only measured directly after the game, meaning that there was no focus on the long-term effects. The long-term effects are more important for the game than the short-term effects, as the goal of persuasive gaming is behavioral change, which was not measured.

In this study, there was no control group which did another activity. This means that even though the game session might have a positive effect, it cannot be compared to the effect for example a presentation on the labor market, which might be more effective. Additionally, the study focused on a specific multi-actor system. Further research should explore the applicability of game-mediated persuasive strategies across a wider range of multi-actor systems and investigate additional factors that may influence attitude change and collaboration.

Another limitation is the forced use of single statements instead of factors. The research would have been stronger if the factors that were designed could have been used for the data analysis, but this was not possible due to the factor analysis that did not support these factors.

Lastly, for this specific case study, it can be advised to the Port of Rotterdam to invest in supporting collaboration between the companies. There is clearly a need for collaboration between companies, but support is likely to be needed to reach more collaboration.

6.5 Reflection on the Research Process

Over the course of my research, I've observed significant personal and professional development in various aspects, as well as found myself struggling with certain aspects of the process.

Although the coaching of my supervisor was very welcome and needed, I also showed a lot of independence during this research. First of all, the idea of the general research topic and the different steps I wanted to take to accomplish this research were my own ideas. I took on many different tasks such as designing the game, planning and taking interviews, conducting game sessions, and writing the thesis. I. This experience underscored my capacity to work autonomously and take initiative in various aspects of a complex project such as a master thesis.

One enduring aspect of this experience is my evolution as a game host. This journey has provided opportunities to refine my skills in leading and managing groups. Handling the diverse challenges posed by different groups showed that I could host a game, even with more difficult groups. The confidence I gained in steering these sessions is a testament to my improved hosting abilities.

An area of growth for me has been in research skills. Delving into literature research to build and utilize statistical analysis tools like SPSS to interpret data has significantly enriched my skill set. These capabilities are not only valuable within the context of this research but also for my future.

I am particularly proud of the comprehensive scope of my involvement in this project. From conceiving and designing the game to orchestrating interviews and conducting sessions, every step has contributed to the understanding of the research process.

While there were challenges, such as structuring the paper effectively, seeking guidance and advice has been overcoming obstacles and refining my writing abilities. Recognizing my areas of vulnerability, like academic writing, and proactively addressing them has been a lesson in self-awareness and effective communication.

A more personal challenge was the motivation to continue the research, especially towards the end, in which writing was the most central task, which was not only the most challenging but also the least enjoyable task of the research. However, with the help of friends and my supervisor, I continued the process. Moreover, the passion I hold for gaming was a force behind my dedication to this research. It provided intrinsic motivation, making the journey engaging and fulfilling. Working collaboratively with a company also offered valuable insights into client communication and project management, broadening my understanding of how academia can support businesses. Engaging with feedback has been a significant aspect of my growth. While I was willing to integrate suggestions, I also demonstrated independence in instances where I did not agree with certain points, not being afraid to explain my view.

As I reflect on this master's thesis journey, I am not only proud of the academic accomplishment but also of the new skills I have learned, academically and as a person.

Chapter 7: Conclusion

In this chapter, a summary of the findings is given, which leads to an answer to the main research question. After this, some recommendations for future research are made. Following, some advice for the Port of Rotterdam is given. This chapter concludes with a few final conclusions.

7.1 Addressing the Research Question

In this chapter, the answer to the sub-questions is given, which finally results in the answer to the main research question.

RQ1: What criteria can be used to assess how promising a game-mediated persuasive strategy is for behavior change in multi-actor systems?

The "5C" criteria proposed by Duke and Geurts (2004) and the additional criteria of emergence and immersion by Mayer et al. (2008) serve as the foundation for reviewing game-mediated persuasive strategies for multi-actor systems. The 5C criteria are understanding Complexity, Improving Communication, Stimulating Creativity, Consensus Building, and Commitment to Action. Emergence refers to the idea that a limited set of elements and rules can lead to numerous outcomes, while immersion relates to flow, cognitive absorption, and presence. Altogether, these criteria ensure that the game enhances participants' understanding of multi-actor system problems, promotes effective communication, stimulates creativity, facilitates consensus, encourages commitment to real-world action, and incorporates emergent and immersive elements.

RQ2: What is the game design for a case study on the tight labor market in the Port of Rotterdam?

The game design for the case study involves a strategic simulation centered around a cat café metaphor. Players start a cat café in the Port of Rotterdam, symbolically representing labor market dynamics through the actions of cats within the café. Players form teams or play individually and use coins to attract cats (employees) with items like cat food, toys, and wellness days. Cats with different colors symbolize different employee priorities. The game progresses through rounds, with actions representing attracting employees, leisure activities, automation, and salary. Cats may migrate between cafés, reflecting labor market movements. The design aims to help players understand labor market challenges and stimulate interaction between different companies. The game is designed in a way that there is no prescriptive message embedded in the game, which prioritizes the input of the players of the game.

RQ3: What experimental design is suitable for this study?

The experiment design involves the following components:

Participants: 158 employees from the Port of Rotterdam and companies in the port area invited.

Materials: "Cat café" paper-based game, PowerPoint presentation, pre-and post-surveys, observation notes, informed consent documents.

Procedure: Inviting participants, explaining the game, conducting gameplay, debriefing, completing surveys, and matching pre- and post-survey data.

Data Analysis Strategies: Descriptive statistics, qualitative analysis of gameplay, component factor analysis, comparing participants' views on the labor market, and comparing groups.

Overall aim: Investigate the impact of the serious game on participants' views of the labor market and game experience.

RQ4: What are the qualitative and quantitative results of the experiment?

Demographics: 26 pre-survey and 25 post-survey responses, primarily women from various companies in the Port area.

Game Experience: Varying enthusiasm in sessions, thematic gameplay variations, and collaborative scenarios discussed during debriefing.

Quality of Data: Non-parametric tests due to non-normal distribution.

Group Differences: Minimal effect of group differences observed.

Labor Market Factors: Predefined variables did not perfectly align with factors, so components cannot be used.

Analysis of Labor Market: Changes in attitude observed towards recognizing a tight labor market and the significance of the work atmosphere in job changes.

RQ5: How can the results of the experiment be interpreted and generalised?

The experiment suggests that the game-mediated persuasive strategy influenced attitudes and facilitated collaboration within multi-actor systems. While changes in attitude might have alternative explanations, the emergence of collaboration as a theme supports the strategy's effectiveness. The game's design allowed diverse gameplay ideas and encouraged collaboration. However, limitations such as a small sample size and potential bias need to be considered, meaning that cautiousness is needed for generalizing the results. However, this research does show potential for using this method for addressing multi-actor systems.

Finally, it is time to answer the main research question, being

How promising is a game-mediated persuasive strategy to change the behaviour of stakeholders to help solve multi-actor system problems?

It can be concluded that there seems potential for using a game-mediated persuasive strategy to change the behavior of stakeholders within multi-actor systems. In the case study, there were indications that the game-mediated persuasive strategy had worked, with the need for collaboration that arose from the players as the biggest argument. However, a lot is still unknown about this subject, such as the long-term effects of this particular game, but also the usefulness of this method for other case studies. It can be concluded that this method seems promising and that a new use of persuasive gaming specifically tailored for multi-actor system problems deserves more research.

7.2 Reflection on Research

In this research, the goal was to use another approach to persuasion games than the games commonly used, with the goal to fit multi-actor systems more. As this had never been done before, this means that this research faced quite a few challenges.

An important challenge was the fact that the literature on the subject was hardly existing, which implied that most of this research was quite experimental. Even though usage of the criteria that were already mentioned in the literature was possible, they had never been used for this specific type of game. Therefore, choosing a limited case study turned out to be the right choice. The novelty of this kind of research does not yet allow us to make greater statements in a more general area. The case study in collaboration of the Port of Rotterdam small also allowed the involvement of real actors, who

are confronted with the problems of the Dutch labor market. A possible negative side effect is that the small scale of the project might have implications for the representativity of my conclusions.

Another challenge is related to the scale of the research team. Even though the research method turned out to be solid, and the data analysis was done thoroughly, it was pretty risky that this project was conducted by a single person (who was not only the game designer, but also conducted the actual game and could therefore theoretically influence the outcome of the game). If people would like to reproduce a similar case study, these issues should be addressed in advance.

7.2 Recommendations for Future Research

The present study has shown the potential of a novel approach to persuasive gaming within multi-actor systems. However, acknowledging the study's limitations can help set the course for future research.

1. Addressing Researcher Bias:

Considering that the game designer and researcher were one and the same, potential bias in interpreting the results needs attention. Although efforts were made to uphold objectivity, future research could benefit from an independent analysis to ensure unbiased interpretation.

2. Expanding Sample Size:

The small sample size used in this study needs cautious generalization of the results. Future investigations should engage a larger and more diverse test group to enhance the robustness and generalizability of the findings.

3. Investigating Group Differences:

Acknowledging the group differences, particularly the variations in attitude between men and women, suggests the value of exploring these differences in more depth with a larger sample. A repeated study with a more extensive sample set would provide a comprehensive insight into these variations.

4. Improved Alignment of Criteria:

The designed criteria for evaluation could have played a more integral role in shaping the questionnaire. Enhancing the correlation between these criteria, the game design, and the research design could strengthen the analytical framework of future studies.

5. Long-term Effects Analysis:

The study's focus on immediate post-game effects overlooks the long-term behavioral changes that persuasive gaming has as a goal. Future research should try a different approach to examine the sustained impact of the game on participants' attitudes and behaviors.

6. Incorporating Control Groups:

The absence of a control group limits the comparative evaluation of the game's effectiveness. Future studies could introduce control groups engaging in alternative activities, like presentations.

7. Expanding Multi-Actor Systems Exploration:

While this study explored one specific multi-actor system, broader applicability remains uncharted territory. Future investigations should diversify the scope by examining the suitability of game-mediated persuasive strategies across different multi-actor systems and investigating other factors that influence attitude change and collaboration.

8. Refined Measurement of Factors:

The limitation arising from the inability to use the designed factors due to factor analysis constraints is noteworthy. Future studies should refine the measurement approach, striving to align the analysis with the initially designed factors for a more comprehensive assessment.

For the Port of Rotterdam, the recommendation emerges to focus on fostering collaboration among companies. The present study's findings underscore the need for collaboration, but it's advised to invest in supportive initiatives that facilitate and encourage such collaboration among stakeholders.

In essence, while this study unveiled promising prospects for game-mediated persuasive strategies within multi-actor systems, the limitations unveiled opportunities for improvement. Addressing these limitations through meticulous future research endeavors could refine the approach's effectiveness, broaden its scope, and unlock its potential to facilitate meaningful change in complex systems.

7.3 Recommendations for the Port of Rotterdam

Besides the academic research, some conclusions for the Port of Rotterdam can also be made based on this case study. The Port of Rotterdam had asked for an intervention with serious gaming to help companies with the tightness of the labor market.

First of all, it can be concluded that there was awareness and knowledge of the tight labor market by the players. However, only a few companies did take part in this experiment. To get a broader perspective on the view of other companies, it can be recommended to play the designed game with players from other companies. This will lead to a more complete idea of the perspective of all the companies in the Port area of Rotterdam.

Secondly, it became clear that collaboration was seen as a solution for many of the players, during each session. However, it also became clear that collaboration between companies to handle the tight labor market is not yet common. The Port of Rotterdam could take the role of bringing the different companies together to handle this current issue. Some ideas to support the companies to collaborate more is organizing brainstorm sessions with companies or designing a tool that can inform companies about the tight labor market. It seems that the Port of Rotterdam is needed to support collaboration on a bigger scale.

Finally, it can be recommended to use the knowledge of the employees of the Port of Rotterdam. In the survey it was asked to the players if they had knowledge about the labor market and some employees think that they did. This knowledge of the Port of Rotterdam can be used to inform other companies and to foster collaboration between those companies. This way, more ideas, and actions can be generated to support companies struggling with the labor shortage.

7.4 Final Conclusion

In conclusion, this study addresses the central research question:

To what extent does a game-mediated persuasive strategy hold promise for influencing stakeholder behavior within multi-actor systems?

Through a comprehensive exploration, this research has not only offered insights into this question, but has also contributed significantly to the literature in this emerging field.

By using the established "5C" criteria with the emergent and immersive dimensions added, this study has contributed a new framework for evaluating the potential of game-mediated persuasive strategies. This framework enriches the understanding of how these strategies can effectively navigate the complexities of multi-actor systems.

Furthermore, the innovative game design exemplified through the cat café metaphor serves as a noteworthy contribution. This design showcases how a game-mediated persuasive strategy can be used for a game specifically designed for multi-actor system problems.

However, it is vital to acknowledge the study's limitations, particularly its focus on a single case study. This necessitates cautious interpretation and emphasizes the need for further research to substantiate and generalize the findings. The potential demonstrated in this research shows that this subject deserves more research into diverse multi-actor contexts with more test subjects.

In essence, while this study provides a foundational step in the exploration of game-mediated persuasive strategies within multi-actor systems, it simultaneously highlights the untapped potential that remains to be explored. This serves as an open invitation to the scholarly community to delve deeper into this evolving domain, unveiling new insights for innovative solutions in addressing the challenges of multi-actor systems with serious gaming.

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Appendix 1: Field research

through interviews with different companies within the port area of Rotterdam, the current issues are discussed. The interviewees are all involved with recruitment in their company. for anonymization, the companies are called companies A to C.

First of all, it became clear from all the interviews that the type of vacancies that are hard to fill are the same for all companies, no matter what kind of industry the company is active in (container, chemical). The tight labor market is affecting certain jobs such as technicians, maintenance and operator, which are all mostly jobs that require MBO.

When asked how the shortages arises, ageing is a problem for all companies. For example, 15 crane machinists are retiring in company C. Company B recognizes that the average age of their company is relatively old, which makes the need to replace people that retire bigger. Education within the company is mentioned by all the companies, which is partly a solution for the problem. However, there is also outflow of employees.

The outflow issue is mostly because of ageing. Most companies do believe that their company is a good company to work for and do not see a lot of personnel switching their jobs. It happens sometimes of course, but the main struggle is to recruit new personnel. When asked why people stay within their company, it is mainly because of the people they can work with.

An issue mentioned by the interviewee of company A is the competition on salary. She thinks that the industry is breaking their own sector by this behaviour. It will result in people that are only motivated by salary, which means that they will leave again if they can earn more for another company. She believes that this also has a negative impact on the kind of employees you attract. When discussing other companies, She describes different kinds of companies. Some companies do choose to create a 'golden cage', knowing that employees will stay within the companies, because they can not find a better salary elsewhere. This behaviour could be recognized in company B, Interviewee B talked about the outflow of personnel and told me that sometimes employees try to work for another company, but most people come back rather soon, because other companies can not give what company B gives. He mentions salary, but also the lease-car and work-hours that they get as reasons to stay within the company.

Interviewee A mentions that other companies react on this behaviour and start increasing their salaries as well, which is a short-term solution. This behaviour could be seen in company C. They mention that they do struggle with the competition of other companies, but have integrated a bonus-structure in 2020 to attract people. Company C gives discount on fitness-subscriptions, which is not directly competition on salary, but could be a way to attract more employees.

Interviewee A continues with saying that some companies do recognize the problems with competition on salary, but still join this, because the pressure can be high to get new employees. There are also some companies that are not able to join this competition, because of financial reasons. In conclusion, she thinks that many companies only think about their own interest, without taking into account the consequences for the industry as a whole.

The interesting thing is that the different behaviour of companies that are mentioned by interviewee A could be recognized within the other companies. Company A does not join this competition on salary and thinks that this competition has a negative effect on the whole company.

It could be said that competitive pay has no negative impact on companies that do have the money, but looking at the literature, we see that competitive pay does have a negative impact for

the company itself. Competitive pay undermines pay for performance, which can result in paying a lot to poor performers (O'Byrne & Gressle, 2013).

However, when interviewing the labor market expert, he also sees opportunities when it comes to the competition of different companies. He claims that the whole sector can become stronger because of this competition. If all companies raises their pay to compete with each other, the whole port becomes more attractive for other companies.

Another issue that is mentioned by the labor market expert is the focus of companies on attracting young employees that just finished their school, something that is also mentioned by the different companies. There are other ways that companies can take actions, for example automation of some processes can help with their labor shortages. Furthermore, companies should not only focus on young graduates, because this is only part of potential new personnel.

In conclusion, the interviews shows that competition between companies is indeed ongoing between companies. By some companies this is viewed as problematic, while the labor market expert also mentions some positive effects of this competition. Overall, it can be concluded that there is a tight labor market in the port sector of Rotterdam is.

Appendix 2: Powerpoint presentation



Welkom



Programma

- Heeft iedereen enquête ingevuld? -> Zo niet, graag eerst invullen!
- Voorstelronde
- Speluitleg
- Spel spelen
- Nabespreken
- Enquête invullen

Voorstellen

- Thijme Lee
- Student aan TU Delft Complex Systems Engineering & Management
- Afstudeerstage bij het Havenbedrijf
- Jullie beurt!

Wat gaan we doen?

- Een spelletje! Maar waarom?
- Jullie zullen mogelijk zaken herkennen uit de werkelijkheid, maar er zullen misschien ook dingen anders zijn.

Katten-café

- Elk team begint een katten-café!
- Gaandeweg in het spel zullen er regels bijkomen en situaties veranderen, de toekomst is dus nog onbekend.
- Het doel is om een goedlopend kattencafe te starten in een stadje met zwerfkatten op straat

Naam

- Bedenk een leuke naam en slogan van je kattencafé

Ronde 1

- Elk café krijgt 5 muntjes om mee te beginnen. Hiermee kunnen jullie kattenvoer kopen om katten aan te trekken.
- Hoeveel muntjes willen jullie uitgeven aan kattenvoer?

Goed bezig!

- De eerste katten zijn in de cafés gekomen en iedereen in het stadje is nieuwsgierig. Elk café heeft dan ook zijn eerste winst gemaakt!

Ronde 2

- Voor een kattencafé moet er natuurlijk nog veel meer gebeuren dan puur voer kopen. Hieronder zien jullie nog wat andere opties om jullie kattencafé aantrekkelijker te maken
- Kattenvoer kopen (1 muntje per bakje kattenvoer)
- Speeltjes kopen (3 muntjes per speeltje)
- 1 robotkat kopen (8 muntjes per robotkat)
- Katten wellnessdag geven (5 muntjes)

Nog meer katten!

- Jullie kattencafés stromen verder vol! Tel je katten en geef door om te weten hoeveel muntjes jullie krijgen

Ronde 3

- Kattenvoer kopen (1 muntje per bakje kattenvoer)
- Speeltjes kopen (3 muntjes per speeltje)
- 1 robotkat kopen (8 muntjes per robotkat)
- Katten wellnessdag geven (5 muntjes)

Katten verplaatsen zich

- Katten zijn eigenwijze dieren en beslissen zelf wel waar ze blijven. Of misschien gaan ze wel terug de straat op!
- Jullie ontvangen natuurlijk ook weer muntjes!

Ronde 4 en verder!

- Kattenvoer kopen (1 muntje per bakje kattenvoer)
- Speeltjes kopen (3 muntjes per speeltje)
- 1 robotkat kopen (8 muntjes per robotkat)
- Katten wellnessdag geven (5 muntjes)

Jullie mogen vanaf nu ook zelf acties bedenken! het is tenslotte jullie kattencafé

Einde spel!

- Korte pauze om wat thee of koffie te halen

Eerste reactie

- Wat vonden jullie van het spel?

Het spel

- Wat is er herkenbaar uit het spel met jullie ervaringen met de arbeidsmarkt?
- Zijn er ook dingen anders in het spel?
- Hoe was jullie eigen gedrag in het spel? Is dit te vergelijken met de werkelijkheid
- Waar staan de verschillende acties voor
- Staan jullie eigen bedachte acties ergens voor

Naar de werkelijkheid

- Zijn er bepaalde lessen die jullie hebben geleerd uit het spel? Dingen die je mee kan nemen naar de werkelijkheid
- Wat kunnen jullie bedrijven anders doen om beter om te gaan met de arbeidsmarkt?

Enquête

- QR-code voor laatste enquête

Bedankt voor jullie aandacht!

Appendix 3: surveys

Pre-survey experiment krapte arbeidsmarkt

Q1 Beste deelnemer,

U wordt uitgenodigd om deel te nemen aan een onderzoeksstudie getiteld 'A new strategy for persuasive game design for complex systems'. Dit onderzoek wordt uitgevoerd door Tijme Lee, Master student aan de TU Delft. Dit onderzoek is in samenwerking met het Havenbedrijf Rotterdam.

Het doel van deze onderzoeksstudie is een nieuwe manier van persuasive gaming te onderzoeken. Hiervoor wordt de krappe arbeidsmarkt binnen de Rotterdamse haven gebruikt als case. De enquête zal u ongeveer 10 minuten kosten om in te vullen. De gegevens zullen worden gebruikt voor het evalueren op de game. We zullen u vragen om verschillende vragen te beantwoorden over de arbeidsmarkt.

Zoals bij elke online activiteit is het risico op een inbreuk altijd mogelijk. Naar ons beste vermogen zullen uw antwoorden in dit onderzoek vertrouwelijk blijven. We zullen elk risico minimaliseren door de gegevens veilig op te slaan in Qualtrics. Ook zal de enquête

anoniem zijn en zullen de Enquête voor en na het experiment gekoppeld worden door de laatste drie cijfers van uw telefoonnummer. Uw deelname aan dit onderzoek is volledig vrijwillig en u kunt zich op elk moment terugtrekken. U bent vrij om vragen over te slaan.

Voor verder contact kunt u Thijme Lee bereiken via T.J.Lee-1@student.tudelft.nl
De verantwoordelijke onderzoeker is Rens Kortmann.

Gaat u akkoord met bovenstaande openingsverklaring?

- Ik ga akkoord (1)
- Ik ga niet akkoord (2)

PreAge Wat is uw leeftijd?

- <18 (1)
- 18-29 (2)
- 30-39 (3)
- 40-49 (4)
- 50-59 (5)
- 60-69 (6)
- 70> (7)

PreGender Wat is uw geslacht?

- Vrouw (1)
- Man (2)
- Anders (3)

PreGamePlayFrequency Hoe vaak speelt u spelletjes in uw vrije tijd (bordspellen, kaartspellen, rollenspellen, etc)? NB we bedoelen hier niet het beoefenen van een sport.

- Zelden (1)
- Een paar keer per jaar (2)
- Maandelijks (3)
- Wekelijks (4)
- Dagelijks (5)

PreGamePlayEnjoyment Vindt u het leuk om spelletjes te spelen in uw vrije tijd?

- Ja, heel leuk (1)
- Ja, een beetje leuk (2)
- Nee, niet zo leuk (3)
- Nee, helemaal niet leuk (4)

PreID Wat zijn de laatste vier cijfers van uw telefoonnummer?

We stellen deze vraag om uw antwoorden op de verschillende vragenlijsten te kunnen koppelen zonder om uw identiteit te hoeven vragen.

Prebedrijf Bent u werkzaam bij het Havenbedrijf Rotterdam?

- Ja (1)
- Nee (4)

PreYearsOfExperience Hoeveel jaar heeft u ervaring met personeelwerving (Bijv. Marketing om nieuw personeel aan te trekken, HR etc.)

Prearbeid1 De volgende stellingen gaan over de arbeidsmarkt. Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.

Er is krapte op de arbeidsmarkt van de havensector

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid2 Het is eenvoudig vacatures in te vullen voor de havensector

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid3 De arbeidsmarkt van de havensector zal vanzelf weer ruimer worden

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)

- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid4 Ik ben op de hoogte van problemen op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid5 Ik heb weinig kennis over de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid6 Ik ben op de hoogte van nieuwe ontwikkelingen op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid7 Het bedrijf waar ik werk onderneemt de juiste acties om te kunnen omgaan met de huidige arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)

- eens (6)
- helemaal eens (7)

Prearbeid8 Het bedrijf waar ik werk heeft veel kennis in huis over de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid9 Het bedrijf waar ik werk moet meer doen om genoeg personeel te houden

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid10 De concurrentie met andere bedrijven wordt harder in tijden van krapte op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid11 Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)

- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid12 We zouden meer openheid moeten geven naar andere bedrijven over het wervingsbeleid

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid13 Ik kan mijn directe collega's iets leren over de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid14 Ik heb weinig invloed op de strategie van mijn bedrijf met betrekking tot de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid15 Mijn bedrijf heeft mij nodig om problemen door de krappe arbeidsmarkt op te lossen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid16 De werksfeer is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid17 Salaris is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid18 Meer uitdaging bij een ander bedrijf is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid19 Mogelijkheden tot opleiding is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid20 De havensector als geheel heeft een sterke positie als het gaat om personeelswerving

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Prearbeid21 De havensector als geheel heeft problemen door de krappe arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Bedankt voor het deelnemen aan de enquête! Klik door om de enquête in te leveren.

Post-survey experiment krapte op arbeidsmarkt

Q57 Beste deelnemer,

U wordt uitgenodigd om deel te nemen aan een onderzoekstudie getiteld 'A new strategy for persuasive game design for complex systems'. Dit onderzoek wordt uitgevoerd door Thijme

Lee, Master student aan de TU Delft. Dit onderzoek is in samenwerking met het Havenbedrijf Rotterdam.

Het doel van deze onderzoeksstudie is een nieuwe manier van persuasive gaming te onderzoeken. Hiervoor wordt de krappe arbeidsmarkt binnen de Rotterdamse haven gebruikt als case. De enquête zal u ongeveer 10 minuten kosten om in te vullen. De gegevens zullen worden gebruikt voor het evalueren op de game. We zullen u vragen om verschillende vragen te beantwoorden over de arbeidsmarkt en spellen.

Zoals bij elke online activiteit is het risico op een inbreuk altijd mogelijk. Naar ons beste vermogen zullen uw antwoorden in dit onderzoek vertrouwelijk blijven. We zullen elk risico minimaliseren door de gegevens veilig op te slaan in Qualtrics. Ook zal de enquête anoniem zijn en zullen de Enquête voor en na het experiment gekoppeld worden door de laatste drie cijfers van uw telefoonnummer. Uw deelname aan dit onderzoek is volledig vrijwillig en u kunt op elk moment terugtrekken. u bent vrij om vragen over te slaan.

Voor verder contact kunt u Thijme Lee bereiken via T.J.Lee-1@student.tudelft.nl
De verantwoordelijke onderzoeker is Rens Kortmann.

Gaat u akkoord met bovenstaande openingsverklaring?

- Ik ga akkoord (1)
- Ik ga niet akkoord (2)

PostID Wat zijn de laatste vier cijfers van uw telefoonnummer?

We stellen deze vraag om uw antwoorden op de verschillende vragenlijsten te kunnen koppelen zonder om uw identiteit te hoeven vragen.

PostGE1

De volgende stellingen gaan over hoe u zich voelde tijdens het spelen van het spel.
Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.

Ik was geboeid door het verhaal van de game.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE2 Ik voelde me succesvol.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE3 Ik voelde me verveeld.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE4 Ik vond het indrukwekkend.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE5 Ik vergat alles om me heen.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE6

Ik voelde me gefrustreerd.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE7 Ik vond het saai.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE8 Ik voelde me geïrriteerd.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE9 Ik voelde me vaardig.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE10 Ik was helemaal geabsorbeerd.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE11

Ik voelde me tevreden.

- helemaal oneens (1)

- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE12 Ik voelde me uitgedaagd.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE13 Ik moest er veel moeite in steken.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

PostGE14 Ik voelde me lekker.

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

De volgende stellingen gaan over de game en de verbinding met de werkelijkheid

Postgame1 De volgende stellingen gaan over de game. Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.

Het spel laat je goed reflecteren op uitdagingen van de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)

- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame2 De metafoor van het kattencafé was goed te begrijpen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame3 de katten gedroegen zich zoals personeel zich ook zou kunnen gedragen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame4 Het spel heeft mij nieuwe inzichten gegeven

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame5 Dit spel spelen zou ik aanraden aan collega's

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame6 Het spel spelen is waardevoller dan het nabespreken van het spel

- helemaal oneens (1)
- oneens (2)

- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame7 Het nabespreken van het spel heeft mij veel geleerd

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame8 Ik snapte de verbinding tussen acties in het spel en de werkelijkheid al tijdens het spel

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame9 Dit spel werkt niet om te reflecteren op de krappe arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postgame10 Ik had liever meer informatie gekregen over de arbeidsmarkt dan dit spel te spelen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

De volgende stellingen gaan over de begrijpbaarheid van de game

Postfeedback1

Het spel zat goed in elkaar

- Helemaal mee oneens (1)
- Mee oneens (2)
- Niet mee eens en niet mee oneens (3)
- Mee eens (4)
- Helemaal mee eens (5)

Postfeedback2 Ik vond het lastig om de speluitleg te volgen

- Helemaal mee oneens (1)
- Mee oneens (2)
- Niet mee eens en niet mee oneens (3)
- Mee eens (4)
- Helemaal mee eens (5)

Postfeedback3 De spelbegeleider kon de vragen uit de groep goed beantwoorden

- Helemaal mee oneens (1)
- Mee oneens (2)
- Niet mee eens en niet mee oneens (3)
- Mee eens (4)
- Helemaal mee eens (5)

Postfeedback4 De debriefing na afloop zette me aan tot denken

- Helemaal mee oneens (1)
- Mee oneens (2)
- Niet mee eens en niet mee oneens (3)
- Mee eens (4)
- Helemaal mee eens (5)

Postfeedback5 Het doel van het spel werd me snel helder

- Helemaal mee oneens (1)
- Mee oneens (2)
- Niet mee eens en niet mee oneens (3)
- Mee eens (4)
- Helemaal mee eens (5)

Postfeedback6 De spelbegeleider zorgde voor een goede sfeer

- Helemaal mee oneens (1)
- Mee oneens (2)
- Niet mee eens en niet mee oneens (3)
- Mee eens (4)
- Helemaal mee eens (5)

De volgende vragen gaan over de arbeidsmarkt en uw visie op de arbeidsmarkt

Postarbeid1 De volgende stellingen gaan over de arbeidsmarkt. Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.

Er is krapte op de arbeidsmarkt in de havensector

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Page Break

Postarbeid2 Het is eenvoudig vacatures in te vullen voor de havensector

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid3 De arbeidsmarkt van de havensector zal vanzelf weer ruimer worden

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid4 Ik ben op de hoogte van problemen op de arbeidsmarkt van de havensector

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid5 Ik heb weinig kennis over de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid6 Ik ben op de hoogte van nieuwe ontwikkelingen op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid7 Het bedrijf waar ik werk onderneemt de juiste acties om te kunnen omgaan met de huidige arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid8 Het bedrijf waar ik werk heeft veel kennis in huis over de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid9 Het bedrijf waar ik werk moet meer doen om genoeg personeel te houden

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid10 De concurrentie met andere bedrijven wordt harder in tijden van krapte op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid11 Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid12 We zouden meer openheid moeten geven naar andere bedrijven over het wervingsbeleid

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid13 Ik kan mijn directe collega's iets leren over de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid14 Ik heb weinig invloed op de strategie van mijn bedrijf met betrekking tot de arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)

- helemaal eens (7)

Postarbeid15 Mijn bedrijf heeft mij nodig om problemen door de krappe arbeidsmarkt op te lossen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid16 De werksfeer is voor personeel een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid17 Salaris is voor personeel een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid18 Meer uitdaging bij een ander bedrijf is voor personeel een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)

- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid19 Mogelijkheden tot opleiding is voor personeel een belangrijke reden om van baan te wisselen

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid20 De havensector als geheel heeft een sterke positie als het gaat om personeelswerving

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Postarbeid21 De havensector als geheel heeft problemen door de krappe arbeidsmarkt

- helemaal oneens (1)
- oneens (2)
- enigszins oneens (3)
- niet oneens en niet eens (4)
- enigszins eens (5)
- eens (6)
- helemaal eens (7)

Bedankt! Bedankt voor het deelnemen aan de enquête! Klik door om de enquête in te leveren.

Pre-survey in English

Appendix X: Survey

Pre-survey experiment: Labor market scarcity

Q1 Dear participant,

You are invited to participate in a research study entitled "A new strategy for persuasive game design for complex systems." This research is conducted by Thijme Lee, a Master's student at TU Delft, in collaboration with the Port of Rotterdam.

The aim of this research study is to explore a new approach to persuasive gaming, using the labor market scarcity in the Port of Rotterdam as a case study. The survey will take approximately 10 minutes to complete. The data will be used to evaluate the game. We will ask you various questions about the labor market.

As with any online activity, there is always a risk of a breach. To the best of our ability, your answers in this research will be kept confidential. We will minimize any risks by securely storing the data in Qualtrics. The survey will also be anonymous, and the pre- and post-experiment surveys will be linked using the last three digits of your phone number. Your participation in this research is completely voluntary, and you may withdraw at any time. You are free to skip any questions.

For further contact, you can reach Thijme Lee at T.J.Lee-1@student.tudelft.nl. The responsible researcher is Rens Kortmann.

Do you agree with the above statement?

- Agree (1)
- Disagree (2)

PreAge What is your age?

- <18 (1)
- 18-29 (2)
- 30-39 (3)
- 40-49 (4)
- 50-59 (5)
- 60-69 (6)
- 70> (7)

PreGender What is your gender?

- Female (1)
- Male (2)
- Other (3)

PreGamePlayFrequency How often do you play games in your free time (board games, card games, role-playing games, etc.)? Note: We are not referring to participating in sports.

Rarely (1)

A few times per year (2)

Monthly (3)

Weekly (4)

Daily (5)

PreGamePlayEnjoyment Do you enjoy playing games in your free time?

Yes, very enjoyable (1)

Yes, somewhat enjoyable (2)

No, not very enjoyable (3)

No, not enjoyable at all (4)

PreID What are the last four digits of your phone number? We ask this question to link your answers to the different questionnaires without requiring your identity.

PreCompany Are you employed by the Port of Rotterdam?

Yes (1)

No (2)

PreYearsOfExperience How many years of experience do you have in personnel recruitment (e.g., marketing to attract new employees, HR, etc.)?

PreWork1 The following statements are about the labor market. Indicate to what extent you agree or disagree with each statement.

There is labor market scarcity in the port sector.

Completely disagree (1)

Disagree (2)

Somewhat disagree (3)

Neither disagree nor agree (4)

Somewhat agree (5)

Agree (6)

Completely agree (7)

PreWork2 It is easy to fill job vacancies in the port sector.

Completely disagree (1)

Disagree (2)

Somewhat disagree (3)

Neither disagree nor agree (4)

Somewhat agree (5)

Agree (6)

Completely agree (7)

PreWork3 The labor market in the port sector will naturally become more favorable again.

Completely disagree (1)

- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork4 I am aware of labor market issues.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork5 I have little knowledge about the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork6 I am aware of new developments in the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork7 The company I work for is taking the right actions to deal with the current labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork8 The company I work for has a lot of knowledge about the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork9 The company I work for needs to do more to retain enough staff.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork10 Competition with other companies becomes tougher during labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork11 Collaboration between companies is important during labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork12 We should provide more transparency to other companies about our recruitment policy.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork13 I can teach my direct colleagues something about the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork14 I have little influence on my company's strategy regarding the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork15 My company needs me to solve problems caused by labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork16 Work environment is an important reason for employees in shortage to change jobs.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork17 Salary is an important reason for employees in shortage to change jobs.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork18 More challenges at another company are an important reason for employees in shortage to change jobs.

- Completely disagree (1)

- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork19 Opportunities for education are an important reason for employees in shortage to change jobs.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork20 The port sector as a whole has a strong position in personnel recruitment.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork21 The port sector as a whole is facing issues due to labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Thank you! Thank you for participating in the survey! Click through to submit the survey.

Post-survey in English

Q57 Dear participant,

You are invited to participate in a research study titled "A new strategy for persuasive game design for complex systems." This research is conducted by Thijme Lee, a Master's student at TU Delft. The study is in collaboration with the Port of Rotterdam.

The aim of this research study is to explore a new approach to persuasive gaming, using the labor market scarcity in the Rotterdam port as a case. The survey will take approximately 10 minutes to complete. The data will be used to evaluate the game. We will ask you various questions about the labor market and games.

As with any online activity, there is always a risk of potential breaches. To the best of our ability, your answers in this research will remain confidential. We will minimize any risks by securely storing the data in Qualtrics. The survey will also be anonymous, and the pre and post-experiment surveys will be linked using the last three digits of your phone number. Your participation in this research is entirely voluntary, and you can withdraw at any time. You are free to skip any questions.

For further contact, you can reach Thijme Lee at T.J.Lee-1@student.tudelft.nl. The responsible researcher is Rens Kortmann.

Do you agree with the above opening statement?

- agree (1)
- do not agree (2)

PostID What are the last four digits of your phone number?

We ask this question to link your responses to the different questionnaires without needing to ask for your identity.

PostGE1

The following statements are about how you felt during the game. Please indicate the extent to which you agree or disagree with each statement.

I was captivated by the story of the game.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE2 I felt successful.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE3 I felt bored.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)

- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE4 I found it impressive.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE5 I forgot everything around me.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE6 I felt frustrated.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE7 I found it boring.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE8 I felt irritated.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE9 I felt skilled.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE10 I was completely absorbed.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE11 I felt satisfied.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE12 I felt challenged.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE13 It required a lot of effort.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PostGE14 I felt good.

- Completely disagree (1)

- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

The following statements are about the game and its connection to reality.

Postgame1 The following statements are about the game. Please indicate the extent to which you agree or disagree with each statement.

The game allows you to reflect well on labor market challenges.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame2 The metaphor of the cat café was easy to understand.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame3 The cats behaved the way staff could behave as well.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame4 The game gave me new insights.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame5 I would recommend playing this game to colleagues.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame6 Playing the game is more valuable than discussing it afterwards.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame7 The discussion after the game taught me a lot.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame8 I understood the connection between actions in the game and reality during the game itself.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

Postgame9 This game does not work for reflecting on the tight labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

The following statements are about the comprehensibility of the game.

Postfeedback1

The game was well put together.

- Completely disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Completely agree (5)

Postfeedback2 I found it difficult to follow the game instructions.

- Completely disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Completely agree (5)

Postfeedback3 The game facilitator was able to answer the group's questions well.

- Completely disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Completely agree (5)

Postfeedback4 The debriefing afterwards made me think.

- Completely disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Completely agree (5)

Postfeedback5 The purpose of the game became clear to me quickly.

- Completely disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Completely agree (5)

Postfeedback6 The game facilitator created a good atmosphere.

- Completely disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Completely agree (5)

PreWork1 The following statements are about the labor market. Indicate to what extent you agree or disagree with each statement.

There is labor market scarcity in the port sector.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork2 It is easy to fill job vacancies in the port sector.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork3 The labor market in the port sector will naturally become more favorable again.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork4 I am aware of labor market issues.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork5 I have little knowledge about the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork6 I am aware of new developments in the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork7 The company I work for is taking the right actions to deal with the current labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork8 The company I work for has a lot of knowledge about the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork9 The company I work for needs to do more to retain enough staff.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork10 Competition with other companies becomes tougher during labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork11 Collaboration between companies is important during labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork12 We should provide more transparency to other companies about our recruitment policy.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork13 I can teach my direct colleagues something about the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork14 I have little influence on my company's strategy regarding the labor market.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork15 My company needs me to solve problems caused by labor market scarcity.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork16 Work environment is an important reason for employees in shortage to change jobs.

- Completely disagree (1)

- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork17 Salary is an important reason for employees in shortage to change jobs.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork18 More challenges at another company are an important reason for employees in shortage to change jobs.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork19 Opportunities for education are an important reason for employees in shortage to change jobs.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork20 The port sector as a whole has a strong position in personnel recruitment.

- Completely disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither disagree nor agree (4)
- Somewhat agree (5)
- Agree (6)
- Completely agree (7)

PreWork21 The port sector as a whole is facing issues due to labor market scarcity.

- Completely disagree (1)
- Disagree (2)

- o Somewhat disagree (3)
- o Neither disagree nor agree (4)
- o Somewhat agree (5)
- o Agree (6)
- o Completely agree (7)

Thank you! Thank you for participating in the survey! Click through to submit the survey.

Appendix 4: Conducting of factors

in this table, the calculations of the different factors can be seen. note that some factors are inverted by using 8 minus the factor.

Factor	Calculation
Pre-View on tightness	Average of Prearbeid1, 8-Prearbeid2, and 8-Prearbeid3
Post-View on tightness	Average of Postarbeid1, 8-Postarbeid2, and 8-Postarbeid3
Pre-Individual knowledge	Average of Prearbeid4, 8-Prearbeid5, and Prearbeid6
Post-Individual knowledge	Average of Postarbeid4, 8-Postarbeid5, and Postarbeid6
Pre-Position of company	Average of Prearbeid7, Prearbeid8, and 8-Prearbeid9
Post-Position of company	Average of Postarbeid7, Postarbeid8, and 8-Postarbeid9

Pre-Collaboration between companies	Average of Prearbeid11 and Prearbeid12
Post-Collaboration between companies	Average of Postarbeid11 and Postarbeid12
Pre-Influence	Average of Prearbeid13, 8-Prearbeid14, and Prearbeid15
Post-Influence	Average of Postarbeid13, 8-Postarbeid14, and Postarbeid15
Pre-Position of sector	Average of Prearbeid20 and 8-Prearbeid21
Post-Position of sector	Average of Postarbeid20 and 8-Postarbeid21

Appendix 5: Game Experience Questionnaire

The In-game Module consists of seven components, identical to the core Module. However, only two items are used for every component. The items for each are listed below. Component scores are computed as the average value of its items.

Competence: Items 2 and 9.

Sensory and Imaginative Immersion: Items 1 and 4.

Flow: Items 5 and 10.

Tension: Items 6 and 8.

Challenge: Items 12 and 13.

Negative affect: Items 3 and 7.

Positive affect: Items 11 and 14.

Appendix 6: Procedure of experiment

In table x, a table can be found in which the procedure of this research is explained. The full explanation of this procedure can be found in the main text

Activity	Description	Date
Recruit participants	Possible participants were approached via the Port of Rotterdam	April 2023
Invite participants	All participants that wanted to participate were sent an affirmation that they could join the session they subscribed	15 May 2023
Share the pre-survey	All participants were asked to complete the pre-survey before the session via mail	18 May 2023
Preparing the session	Before the session started, the game host prepared the Powerpoint, made sure that the game was ready for use and put all the informed consent papers on the table	22, 23 & 29 May 2023
Signing informed consent form	On the day of the experiment, all participants were asked to fill out the informed consent form	22, 23 & 29 May 2023
Introduction of game-host and players	The game host introduced themselves and all players shortly introduced themselves	22, 23 & 29 May 2023
Explanation of the game	The game was explained	22, 23 & 29 May 2023
Playing the game	The game was played by the players. The host made notes during this gameplay	22, 23 & 29 May 2023
Break	After the game-session, a 10-minute break was held	22, 23 & 29 May 2023
Debriefing	In the debriefing, the players were asked their opinion on the game and their view on the labor market. This conversation was mostly led by the players themselves	22, 23 & 29 May 2023
Post-survey	All players were asked to fill out the post-survey directly	22, 23 & 29 May 2023

	after the debriefing, while still in the room with everyone else	
Tidy up the game	The game was Tidied up by the game-host	22, 23 & 29 May 2023
Data matching	After all experiments were done, the data of the pre- and post-survey was matched, to make the data ready for analysis	June 2023
Deleting data	All retrieved data is deleted after the research was done	September 2023

Appendix 7: informed consent form

Experiment

Beste,

U wordt uitgenodigd om deel te nemen aan een onderzoeksstudie getiteld 'A new strategy for persuasive game design for complex systems' Dit onderzoek wordt uitgevoerd door Thijme Lee, Master student aan de TU Delft. Dit onderzoek is in samenwerking met het Havenbedrijf Rotterdam.

Het doel van deze onderzoeksstudie is een nieuwe manier van persuasive gaming te onderzoeken. Hiervoor wordt de krappe arbeidsmarkt binnen de Rotterdamse haven gebruikt als case. De gamesessie zal maximaal 3 uur duren. Er zullen naast de surveys ook tijdens de game sessie fysieke observaties worden meegenomen in dit onderzoek.

Zoals bij elke online activiteit is het risico op een inbreuk altijd mogelijk. Naar ons beste vermogen zullen uw antwoorden in dit onderzoek vertrouwelijk blijven. We zullen elk risico minimaliseren door de gegevens veilig op te slaan in onedrive. De aantekeningen zullen anoniem zijn en dus niet gekoppeld worden aan een persoon.

Uw deelname aan dit onderzoek is volledig vrijwillig en u kunt op elk moment terugtrekken. u bent vrij om vragen over te slaan.

Voor verder contact kunt u Thijme Lee bereiken via T.J.Lee-1@student.tudelft.nl

De corresponderende onderzoeker is Rens Kortmann en is te bereiken via L.J.Kortmann@tudelft.nl

De verantwoordelijke onderzoeker is Cees van Beers en is te bereiken via C.P.vanbeers@tudelft.nl

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICIPANT TASKS AND VOLUNTARY PARTICIPATION		
1. Ik heb de informatie over het onderzoek gedateerd 11/05/2023 gelezen en begrepen, of deze is aan mij voorgelezen. Ik heb de mogelijkheid gehad om vragen te stellen over het onderzoek en mijn vragen zijn naar tevredenheid beantwoord.	<input type="checkbox"/>	<input type="checkbox"/>
2. Ik doe vrijwillig mee aan dit onderzoek, en ik begrijp dat ik kan weigeren vragen te beantwoorden en mij op elk moment kan terugtrekken uit de studie, zonder een reden op te hoeven geven.	<input type="checkbox"/>	<input type="checkbox"/>
3. Ik begrijp dat mijn deelname aan het onderzoek de volgende punten betekent -Er worden geschreven aantekeningen van de sessie gemaakt van de game sessie en deze worden gebruikt voor het onderzoek	<input type="checkbox"/>	<input type="checkbox"/>
4. Ik begrijp dat mijn deelname aan het onderzoek niet wordt gecompenseerd	<input type="checkbox"/>	<input type="checkbox"/>
5. 5. Ik begrijp dat de studie eindigt na eindbeoordeling. Naar verwachting is dit op 01/09/2023	<input type="checkbox"/>	<input type="checkbox"/>
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
6. Ik begrijp dat mijn deelname de volgende risico's met zich meebrengt. -Ongemak tijdens het spelen van het spel	<input type="checkbox"/>	<input type="checkbox"/>
PLEASE TICK THE APPROPRIATE BOXES	Yes	No
-conflict binnen het spel Ik begrijp dat deze risico's worden geminimaliseerd door -mogelijkheid om altijd (tijdelijk) te stoppen met het experiment	<input type="checkbox"/>	<input type="checkbox"/>
7. Ik begrijp dat mijn deelname betekent dat er persoonlijke identificeerbare informatie en onderzoeksdata worden verzameld, met het risico dat ik hieruit geïdentificeerd kan worden. Alle aantekeningen zullen anoniem gemaakt worden en hierdoor niet terug te leiden zijn naar een specifiek persoon	<input type="checkbox"/>	<input type="checkbox"/>
8. Ik begrijp dat binnen de Algemene verordening gegevensbescherming (AVG) een deel van deze persoonlijk identificeerbare onderzoeksdata als gevoelig wordt beschouwd.	<input type="checkbox"/>	<input type="checkbox"/>
9. Ik begrijp dat de volgende stappen worden ondernomen om het risico van een databreuk te minimaliseren, en dat mijn identiteit op de volgende manieren wordt beschermd in het geval van een databreuk - de data zal anoniem worden verzameld -de data zal veilig worden opgeslagen	<input type="checkbox"/>	<input type="checkbox"/>

10. Ik begrijp dat de persoonlijke informatie die over mij verzameld wordt en mij kan identificeren, zoals naam en bedrijf waar u werkzaam bent niet gedeeld worden buiten het studieteam.	<input type="checkbox"/>	<input type="checkbox"/>
11. Ik begrijp dat de persoonlijke data die over mij verzameld wordt, vernietigd wordt op 01-09-2023	<input type="checkbox"/>	<input type="checkbox"/>
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
12. Ik begrijp dat na het onderzoek de geanonimiseerde informatie gebruikt zal worden voor een master thesis verslag.	<input type="checkbox"/>	<input type="checkbox"/>
D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE		
16. Ik geef toestemming om de geanonimiseerde aantekeningen van het experiment die over mij verzameld worden gearhiveerd worden in TU Delft education repository opdat deze gebruikt kunnen worden voor toekomstig onderzoek en onderwijs.	<input type="checkbox"/>	<input type="checkbox"/>
17. Ik begrijp dat de toegang tot deze repository open is.	<input type="checkbox"/>	<input type="checkbox"/>

Signatures

Naam deelnemer

Handtekening

Datum

Ik, **de onderzoeker**, verklaar dat ik de informatie en het instemmingsformulier correct aan de potentiële deelnemer heb voorgelezen en, naar het beste van mijn vermogen, heb verzekerd dat de deelnemer begrijpt waar hij/zij vrijwillig mee instemt.

Naam onderzoeker

Handtekening

Datum

Contactgegevens van de onderzoeker voor verdere informatie: [Naam, telefoonnummer, emailadres]

Appendix 8: group differences

Gender

For gender, a Mann-Whitney U test is done, because all respondents identified themselves as men or women. All variables are taken into account for this test. For some variables a significant difference is found.

First of all, The Mann-Whitney U test reveals a significant difference for the statement '*I forgot everything around me*' between women (n1=15) and men (n2=6), $U=19500$, $p=0.04$. Women significantly forgot their surroundings more than men.

Secondly, the Mann-Whitney U test reveals a significant difference on the factor preinfluence between women (n1=18) and men (n2=6), $U=20000$, $p=0.02$, meaning that men significantly estimate their influence within their company higher when it comes to the tight labor market.

This difference is still apparent after the game, in which the Mann-Whitney U test reveals a significant difference on the factor postinfluence between women(n1=15) and men(n2=6) $U=18000$, $p=0.04$. In conclusion, men estimate their influence on their company higher than women when it comes to the tight labor market.

Age

To compare different age groups, the Kruskal-Wallis H test is used. For two variables, a significant difference is found.

First of all, a Kruskal Wallis H test revealed a significant difference for the statement 'The debriefing made me think' across 4 different groups. The results revealed a significant difference between age groups, $H(3)=9.00$, $p=0.03$

Secondly, a Kruskal Wallis H test revealed a significant difference for the factor collaboration in the presurvey across 4 age groups, $H(3)=10.536$, $p=0.02$ Gameplay Frequency. The Kruskal-Wallis H test is used to see if there is any difference between players who frequently play games and players who do not. Significant differences are found for two variables.

A Kruskal-Wallis H test revealed that there is a significant difference on the variable *absorbed* between 4 different groups, $H(3)=9.215$, $p=0.03$.

There is also a significant difference found for the variable postsector with the Kruskal-Wallis H test between 4 different groups, $H(3)=8.079$, $p=0.04$.

Gameplay Enjoyment

For the gameplay enjoyment, the Kruskal-Wallis H test is also used to find any statistical significant differences. However, for this variable, no differences were found, meaning that the gameplay enjoyment did not influence the experience of the game or the vision of the labor market.

Experiment Group

The four groups in which the respondents have taken part to the experiment are compared with the Kruskal-Wallis H test. A statistical difference is found for four different variables.

First, a statistical significant difference is found for the statement 'I wish I had gotten more explanation about the labor market instead' with four groups, $H(3)=8.892$, $p=0.03$.

Secondly, a statistical significant difference is found for the statement 'I would recommend this game to a colleague' with four groups, $H(3)=9.046$, $p=0.03$.

Third, a statistical difference is found for the statement 'The game explanation was hard to follow' with four groups, $H(3)=10.500$, $p=0.02$.

Fourth, a statistical significant difference is found for the variable challenge with four groups, $H(3)=8.391$, $p=0.04$.

Employer

For the employer-group, the Mann-Whitney U test is used, because the answer was binary. The question asked was if the employee works for the Port of Rotterdam, meaning that this test can show if there is a difference between behaviour of the employees Port of Rotterdam in comparison with employees outside of the Port of Rotterdam.

There is only one variable for which a statistical difference can be found. The Mann-Whitney U test shows a significant difference for the statement '*The game facilitator created a good atmosphere*' between employees of the Port of Rotterdam ($n_1=11$) and other employees ($n_2=10$), $U=20000$, $p=0.01$, meaning that employees of the Port of Rotterdam are significantly more positive about the atmosphere the game facilitator created.

Appendix 9: Test of Normality

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Wat is uw leeftijd?	,200	15	,111	,867	15	,030
Wat is uw geslacht?	,419	15	<,001	,603	15	<,001
Hoe vaak speelt u spelletjes in uw vrije tijd (bordspellen, kaartspellen, rollenspellen, etc)? NB we bedoelen hier niet het beoefenen van een sport.	,203	15	,095	,889	15	,064
Vindt u het leuk om spelletjes te spelen in uw vrije tijd?	,251	15	,012	,799	15	,004
Bent u werkzaam bij het Havenbedrijf Rotterdam?	,350	15	<,001	,643	15	<,001
De havensector als geheel heeft problemen door de krappe arbeidsmarkt	,217	15	,056	,862	15	,026
arbeid 1 Er is krapte op de arbeidsmarkt in de havensector	,212	15	,068	,817	15	,006
Het is eenvoudig vacatures in te vullen voor de havensector	,258	15	,008	,881	15	,049

De arbeidsmarkt van de havensector zal vanzelf weer ruimer worden	,278	15	,003	,861	15	,025
Ik ben op de hoogte van problemen op de arbeidsmarkt	,311	15	<,001	,853	15	,019
Ik heb weinig kennis over de arbeidsmarkt	,328	15	<,001	,777	15	,002
Ik ben op de hoogte van nieuwe ontwikkelingen op de arbeidsmarkt	,300	15	<,001	,785	15	,002
Het bedrijf waar ik werk onderneemt de juiste acties om te kunnen omgaan met de huidige arbeidsmarkt	,278	15	,003	,836	15	,011
Het bedrijf waar ik werk heeft veel kennis in huis over de arbeidsmarkt	,336	15	<,001	,701	15	<,001
Het bedrijf waar ik werk moet meer doen om genoeg personeel te houden	,291	15	,001	,863	15	,026
De concurrentie met andere bedrijven wordt harder in tijden van krapte op de arbeidsmarkt	,276	15	,003	,779	15	,002
Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt	,333	15	<,001	,819	15	,006
We zouden meer openheid moeten geven naar andere bedrijven over het wervingsbeleid	,195	15	,128	,896	15	,082
Ik kan mijn directe collega's iets leren over de arbeidsmarkt	,237	15	,023	,839	15	,012

Ik heb weinig invloed op de strategie van mijn bedrijf met betrekking tot de arbeidsmarkt	,244	15	,017	,855	15	,021
Mijn bedrijf heeft mij nodig om problemen door de krappe arbeidsmarkt op te lossen	,200	15	,111	,867	15	,030
De werksfeer is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	,391	15	<,001	,734	15	<,001
Salaris is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	,237	15	,023	,912	15	,143
Meer uitdaging bij een ander bedrijf is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	,269	15	,005	,841	15	,013
Mogelijkheden tot opleiding is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	,379	15	<,001	,616	15	<,001
De havensector als geheel heeft een sterke positie als het gaat om personeelwerving	,181	15	,199	,946	15	,465
De havensector als geheel heeft problemen door de krappe arbeidsmarkt	,283	15	,002	,842	15	,013
Er is krapte op de arbeidsmarkt in de havensector	,299	15	<,001	,693	15	<,001

Het is eenvoudig vacatures in te vullen voor de havensector	,258	15	,008	,882	15	,050
De arbeidsmarkt van de havensector zal vanzelf weer ruimer worden	,223	15	,043	,899	15	,093
Ik ben op de hoogte van problemen op de arbeidsmarkt van de havensector	,283	15	,002	,801	15	,004
Ik heb weinig kennis over de arbeidsmarkt	,288	15	,002	,758	15	,001
Ik ben op de hoogte van nieuwe ontwikkelingen op de arbeidsmarkt	,288	15	,002	,783	15	,002
Het bedrijf waar ik werk onderneemt de juiste acties om te kunnen omgaan met de huidige arbeidsmarkt	,326	15	<,001	,778	15	,002
Het bedrijf waar ik werk heeft veel kennis in huis over de arbeidsmarkt	,405	15	<,001	,671	15	<,001
Het bedrijf waar ik werk moet meer doen om genoeg personeel te houden	,166	15	,200*	,921	15	,199
De concurrentie met andere bedrijven wordt harder in tijden van krapte op de arbeidsmarkt	,233	15	,027	,823	15	,007
Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt	,283	15	,002	,801	15	,004

We zouden meer openheid moeten geven naar andere bedrijven over het wervingsbeleid	,308	15	<,001	,686	15	<,001
Ik kan mijn directe collega's iets leren over de arbeidsmarkt	,353	15	<,001	,728	15	<,001
Ik heb weinig invloed op de strategie van mijn bedrijf met betrekking tot de arbeidsmarkt	,288	15	,002	,835	15	,011
Mijn bedrijf heeft mij nodig om problemen door de krappe arbeidsmarkt op te lossen	,207	15	,082	,936	15	,331
De werksfeer is voor personeel een belangrijke reden om van baan te wisselen	,340	15	<,001	,758	15	,001
Salaris is voor personeel een belangrijke reden om van baan te wisselen	,305	15	<,001	,766	15	,001
Meer uitdaging bij een ander bedrijf is voor personeel een belangrijke reden om van baan te wisselen	,300	15	<,001	,785	15	,002
Mogelijkheden tot opleiding is voor personeel een belangrijke reden om van baan te wisselen	,373	15	<,001	,769	15	,001
De havensector als geheel heeft een sterke positie als het gaat om personeelswerving	,168	15	,200*	,924	15	,218
geboeid	,345	15	<,001	,763	15	,001
Succesvol	,163	15	,200*	,882	15	,051

Verveeld	,300	15	<,001	,799	15	,004
Indrukwekkend	,288	15	,002	,783	15	,002
Vergat alles om me heen	,162	15	,200*	,878	15	,044
Gefrustreerd	,394	15	<,001	,682	15	<,001
Saai	,333	15	<,001	,782	15	,002
Geïrriteerd	,331	15	<,001	,714	15	<,001
Vaardig	,311	15	<,001	,806	15	,004
Geabsorbeerd	,233	15	,027	,880	15	,047
Tevreden	,264	15	,006	,826	15	,008
Uitgedaagd	,283	15	,002	,801	15	,004
Veel moeite	,253	15	,011	,828	15	,009
Lekker	,418	15	<,001	,574	15	<,001
De volgende stellingen gaan over de game. Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.	,326	15	<,001	,755	15	,001
Het spel laat je goed reflecteren op uitdagingen van de arbeidsmarkt						
De metafoor van het kattencafé was goed te begrijpen	,402	15	<,001	,694	15	<,001
de katten gedroegen zich zoals personeel zich ook zou kunnen gedragen	,263	15	,006	,868	15	,031
Het spel heeft mij nieuwe inzichten gegeven	,335	15	<,001	,832	15	,010
Dit spel spelen zou ik aanraden aan collega's	,304	15	<,001	,808	15	,005

Het spel spelen is waardevoller dan het nabespreken van het spel	,272	15	,004	,878	15	,044
Het nabespreken van het spel heeft mij veel geleerd	,232	15	,029	,883	15	,052
Ik snapte de verbinding tussen acties in het spel en de werkelijkheid al tijdens het spel	,378	15	<,001	,705	15	<,001
Dit spel werkt niet om te reflecteren op de krappe arbeidsmarkt	,353	15	<,001	,728	15	<,001
Ik had liever meer informatie gekregen over de arbeidsmarkt dan dit spel te spelen	,264	15	,006	,869	15	,032
Het spel zat goed in elkaar	,535	15	<,001	,284	15	<,001
Ik vond het lastig om de speluitleg te volgen	,362	15	<,001	,692	15	<,001
De spelbegeleider kon de vragen uit de groep goed beantwoorden	,485	15	<,001	,499	15	<,001
De debriefing na afloop zette me aan tot denken	,425	15	<,001	,631	15	<,001
Het doel van het spel werd me snel helder	,535	15	<,001	,284	15	<,001
De spelbegeleider zorgde voor een goede sfeer	,419	15	<,001	,603	15	<,001
prekrapte	,127	15	,200*	,927	15	,246
postkrapte	,157	15	,200*	,936	15	,339
Prekennis	,126	15	,200*	,962	15	,729
Postkennis	,187	15	,169	,937	15	,351
Presamenwerking	,186	15	,170	,955	15	,606

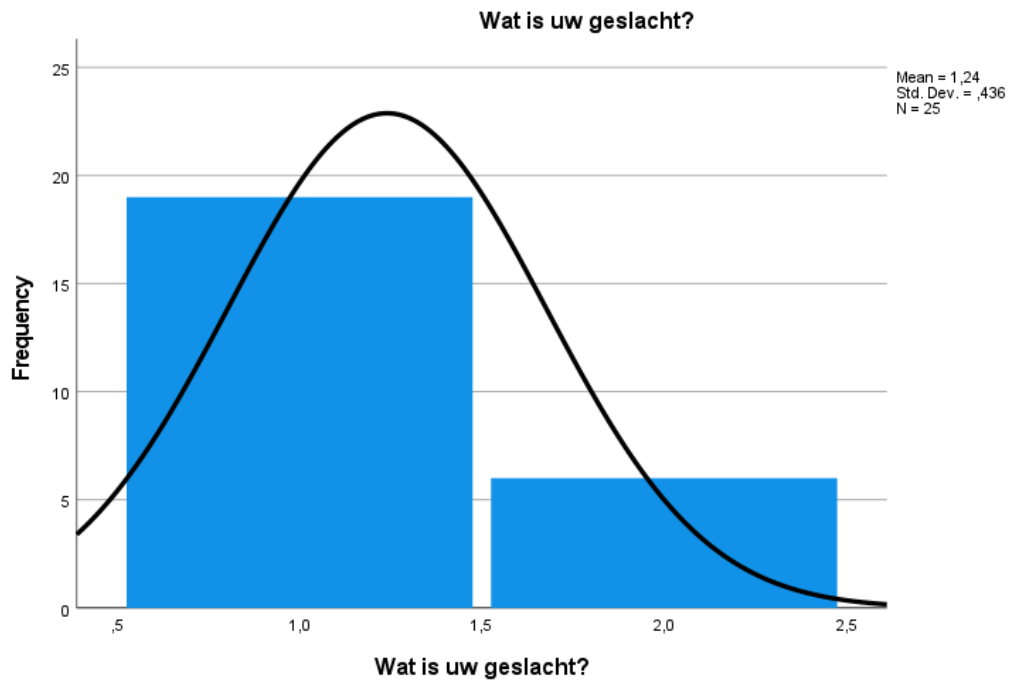
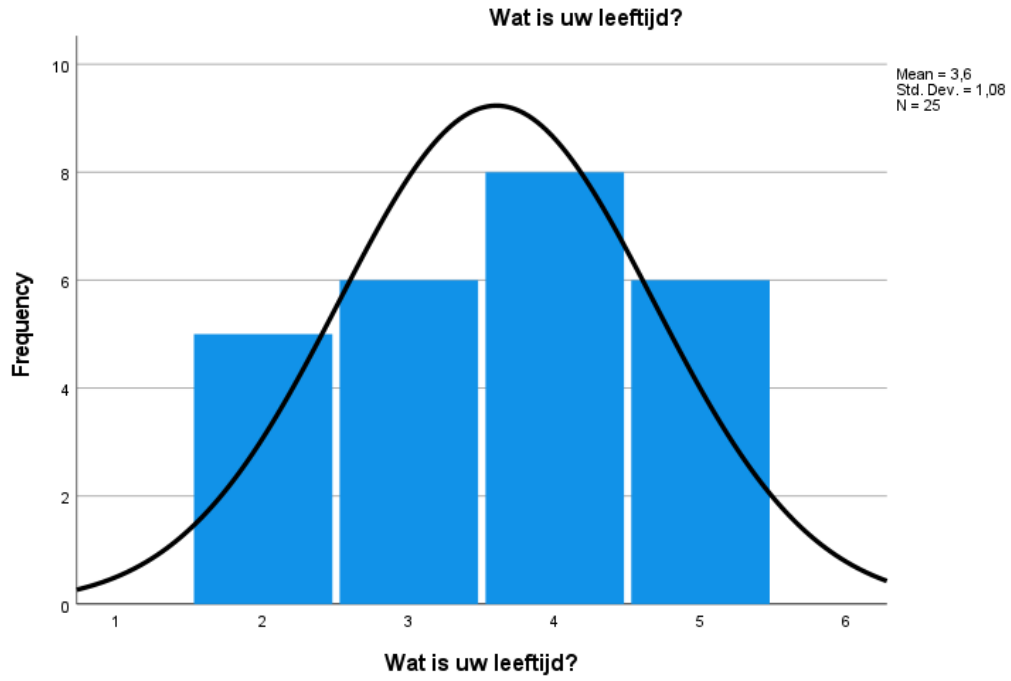
Postsamenwerking	,187	15	,169	,913	15	,149
Preinvloed	,201	15	,103	,815	15	,006
Postinvloed	,225	15	,040	,833	15	,010
Presector	,172	15	,200*	,951	15	,548
Postsector	,167	15	,200*	,904	15	,108
Prebedrijfpositie	,229	15	,033	,932	15	,295
Postbedrijfpositie	,243	15	,017	,831	15	,010
competence	,176	15	,200*	,930	15	,274
Flow	,186	15	,172	,916	15	,165
Tension	,327	15	<,001	,817	15	,006
challenge	,173	15	,200*	,923	15	,216
Negativeaffect	,254	15	,010	,885	15	,057
Positiveaffect	,353	15	<,001	,697	15	<,001
Sensoryandimaginativeim- mersion	,204	15	,093	,927	15	,246

*. This is a lower bound of the true significance.

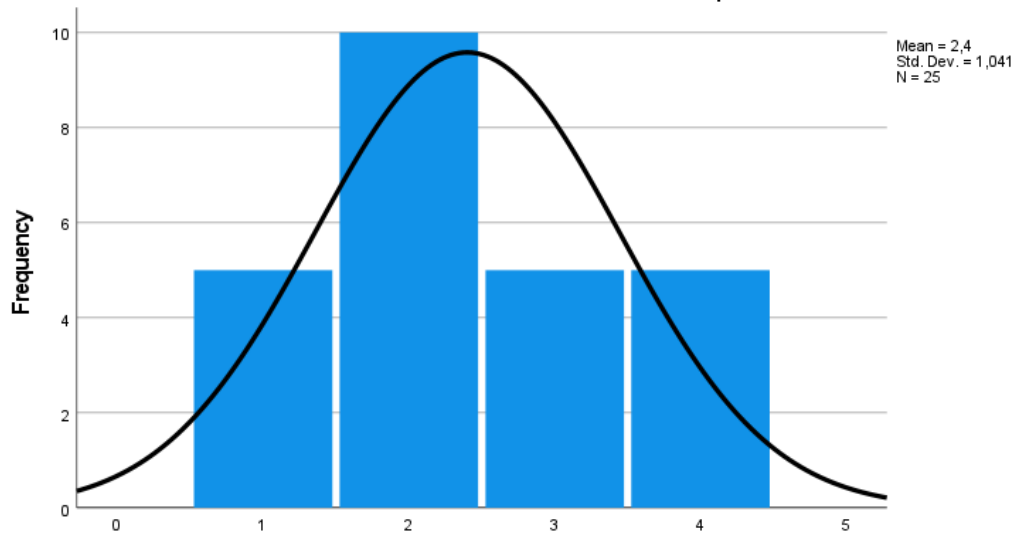
a. Lilliefors Significance Correction

Appendix 10: Descriptive statistics

Pre-survey

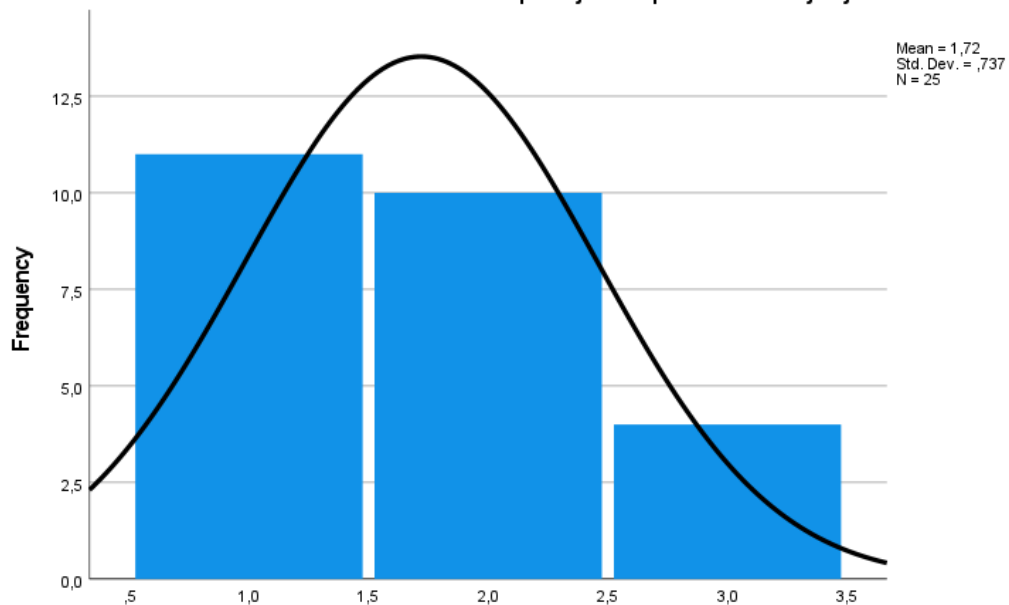


Hoe vaak speelt u spelletjes in uw vrije tijd (bordspellen, kaartspellen, rollenspellen, etc)? NB we bedoelen hier niet het beoefenen van een sport.

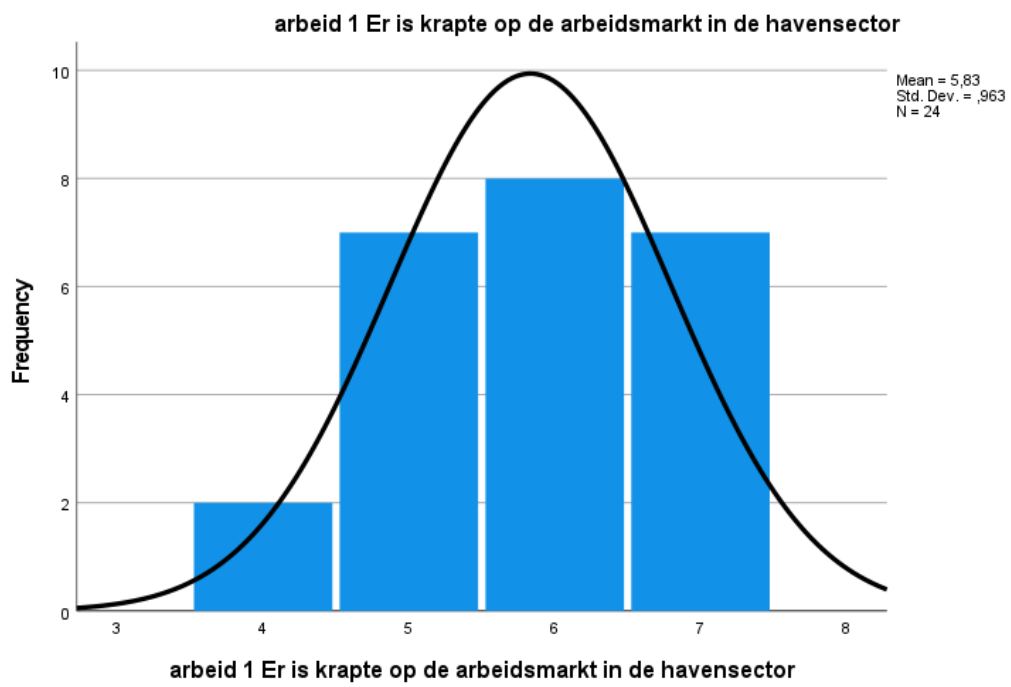
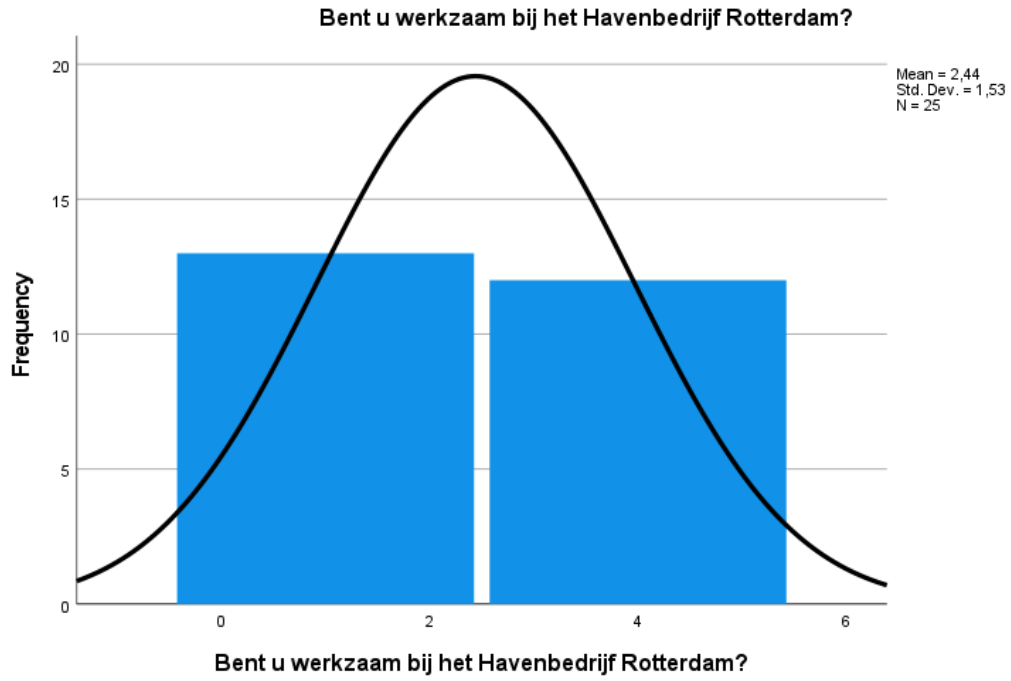


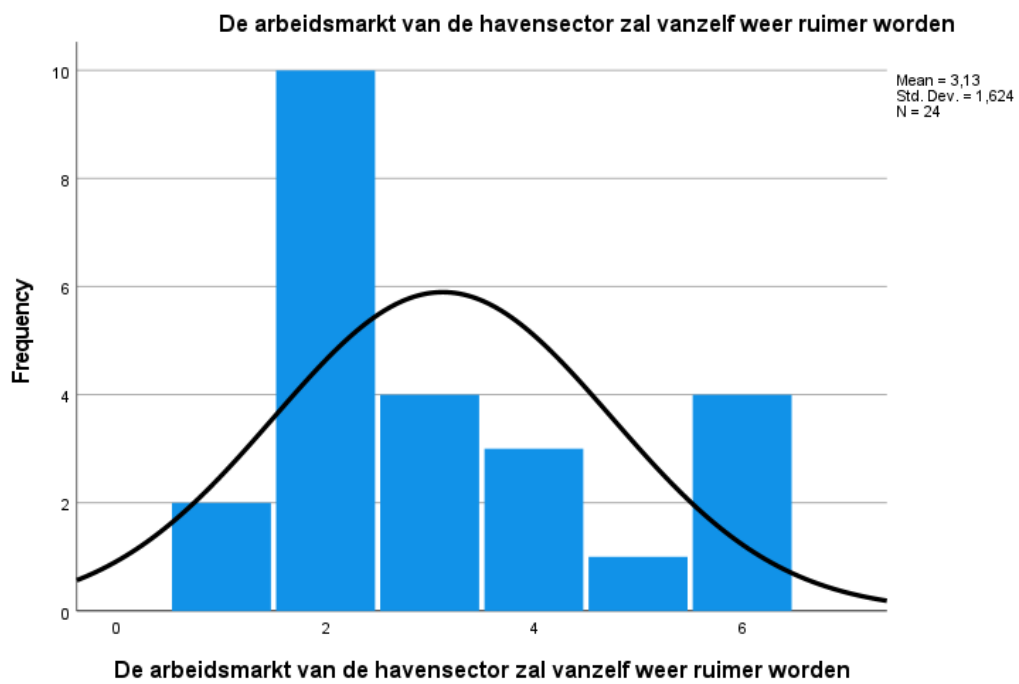
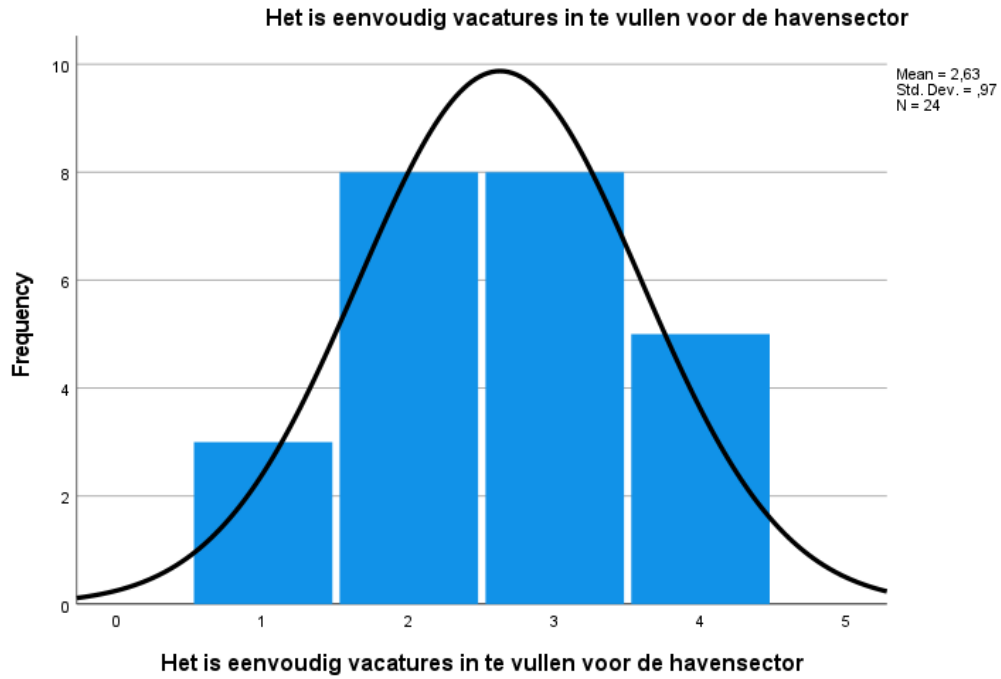
Hoe vaak speelt u spelletjes in uw vrije tijd (bordspellen, kaartspellen, rollenspellen, etc)? NB we bedoelen hier niet het beoefenen van een sport.

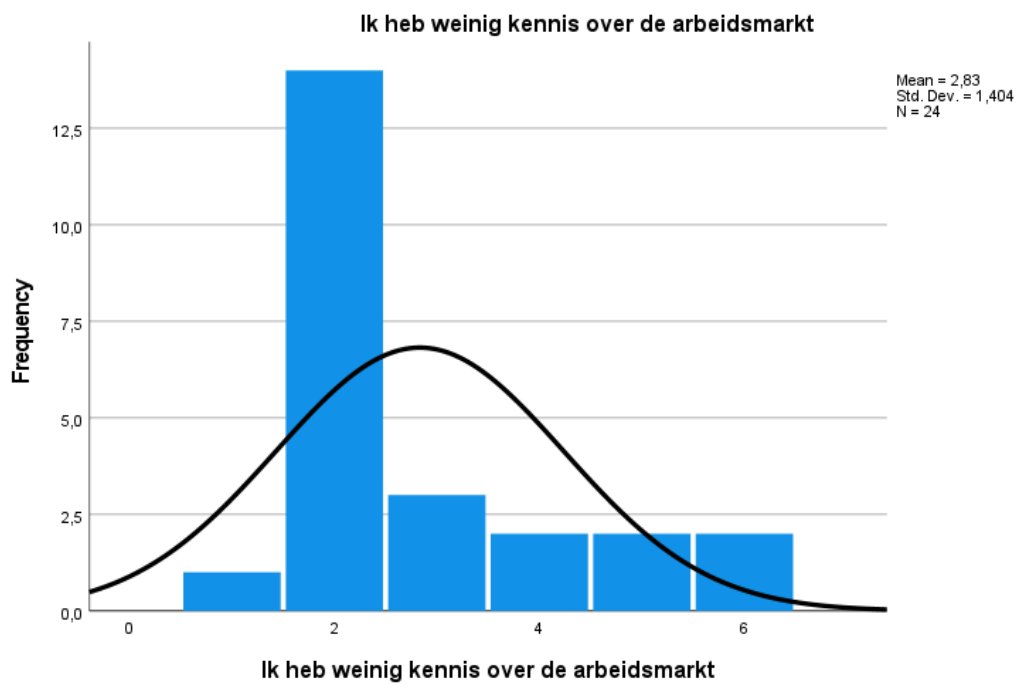
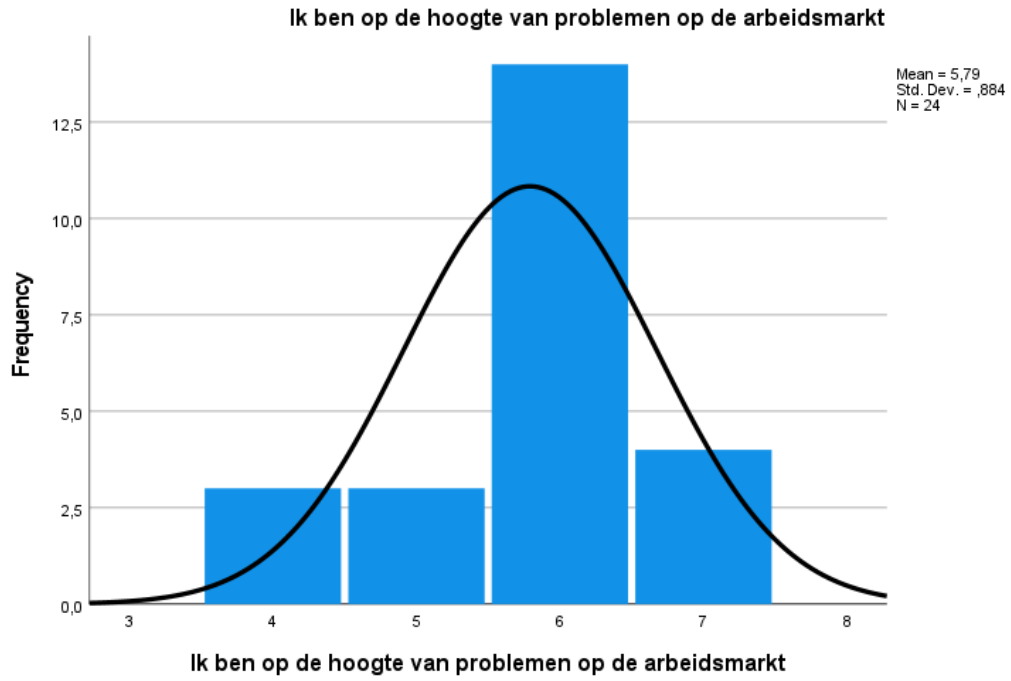
Vindt u het leuk om spelletjes te spelen in uw vrije tijd?

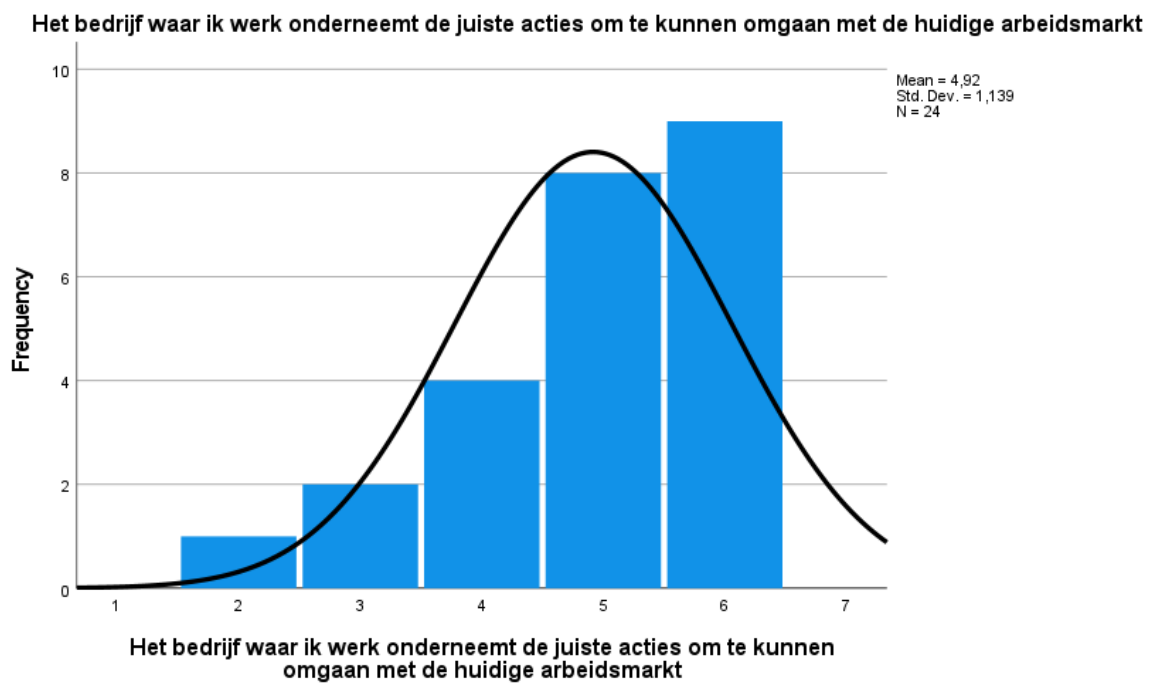


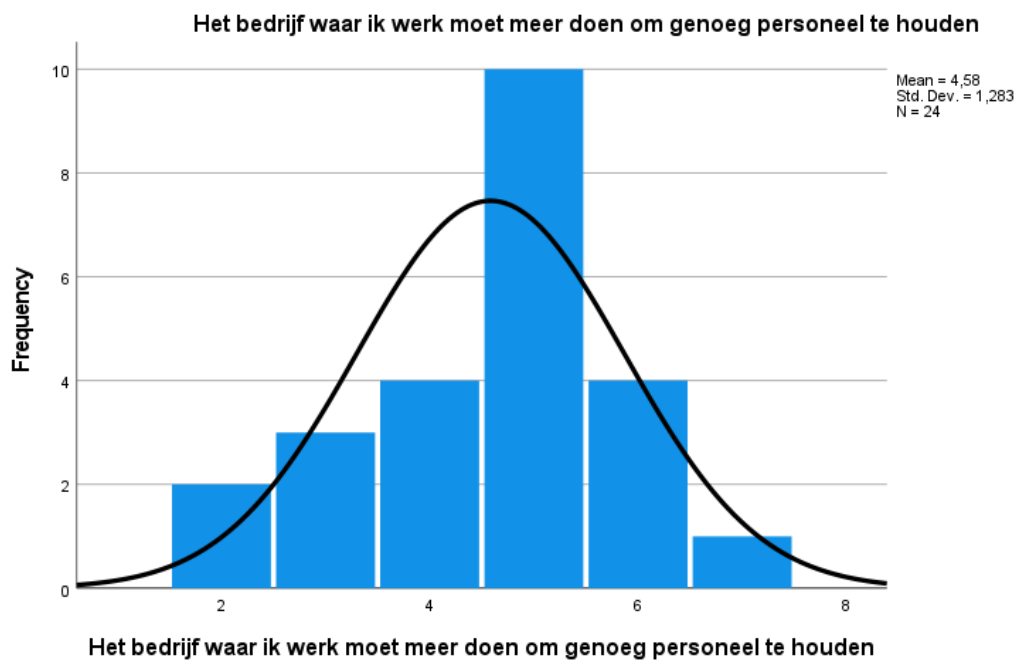
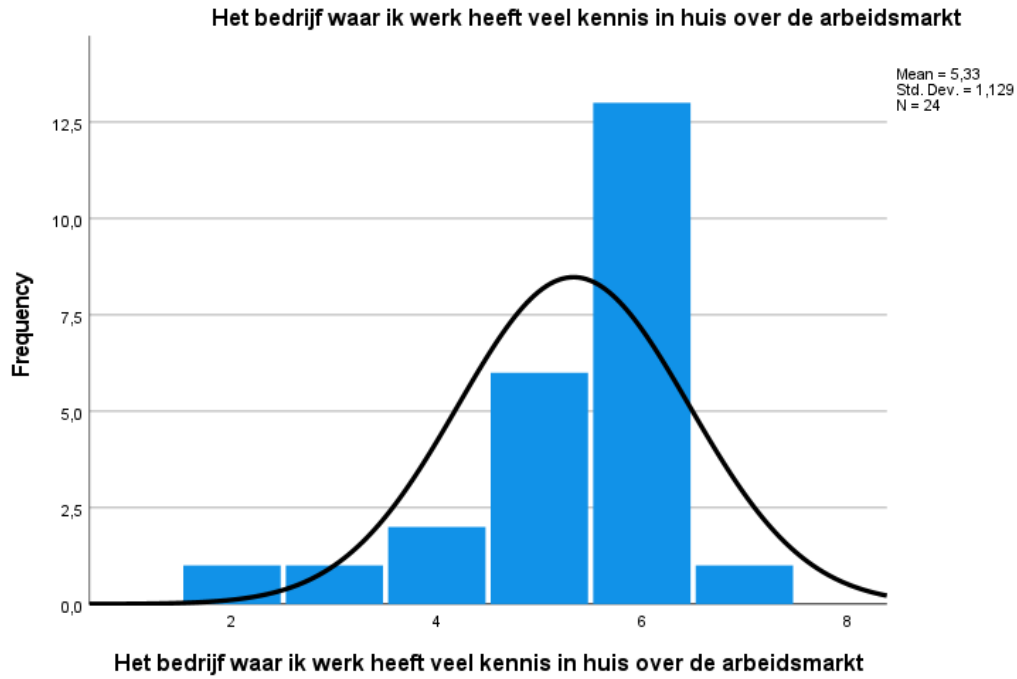
Vindt u het leuk om spelletjes te spelen in uw vrije tijd?



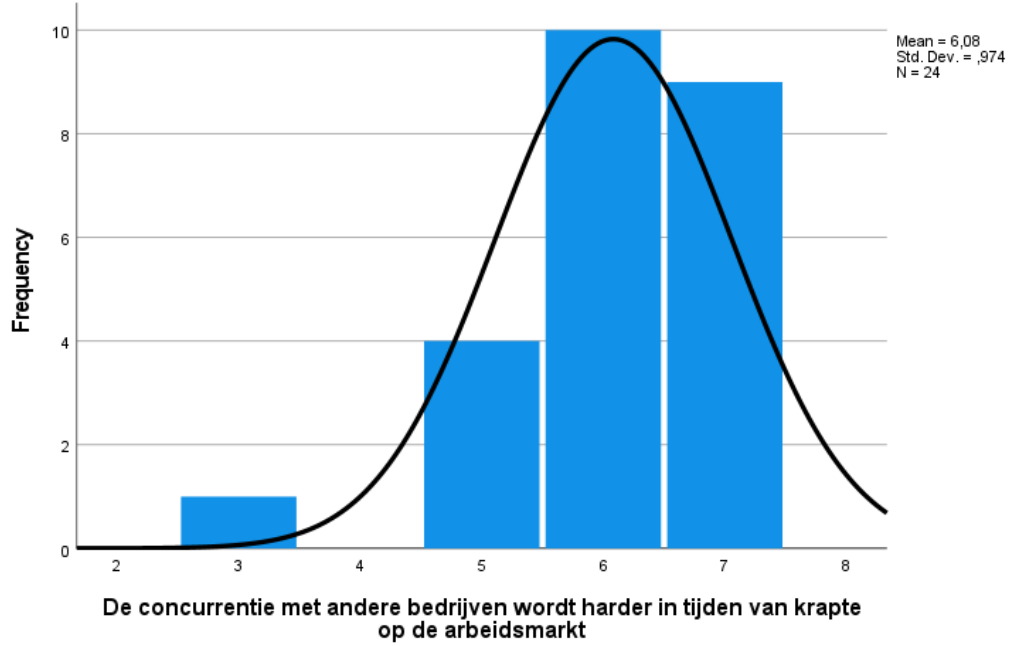




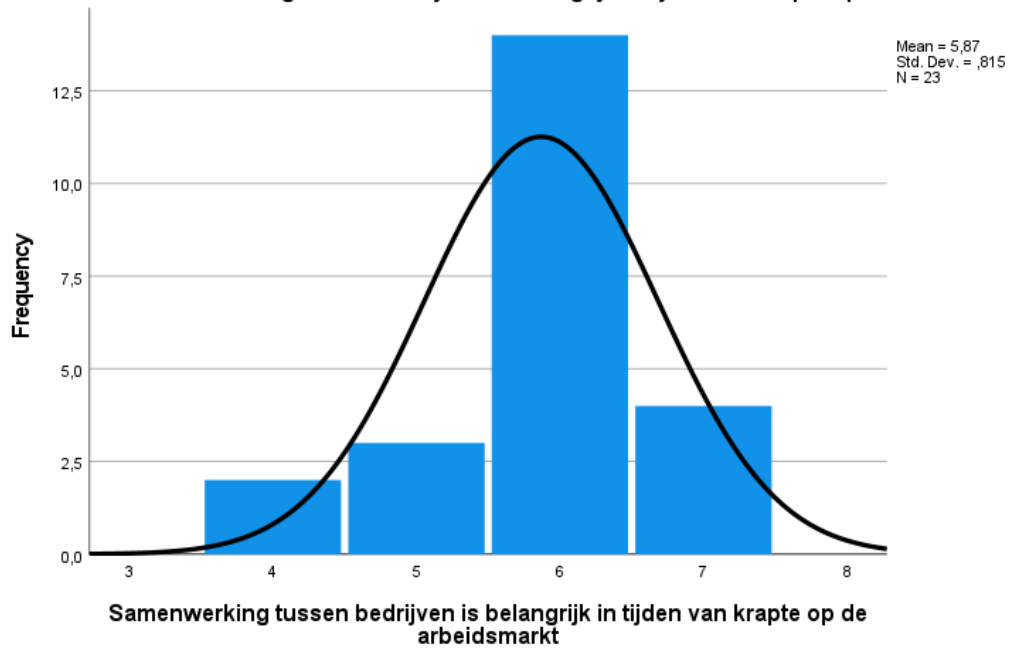


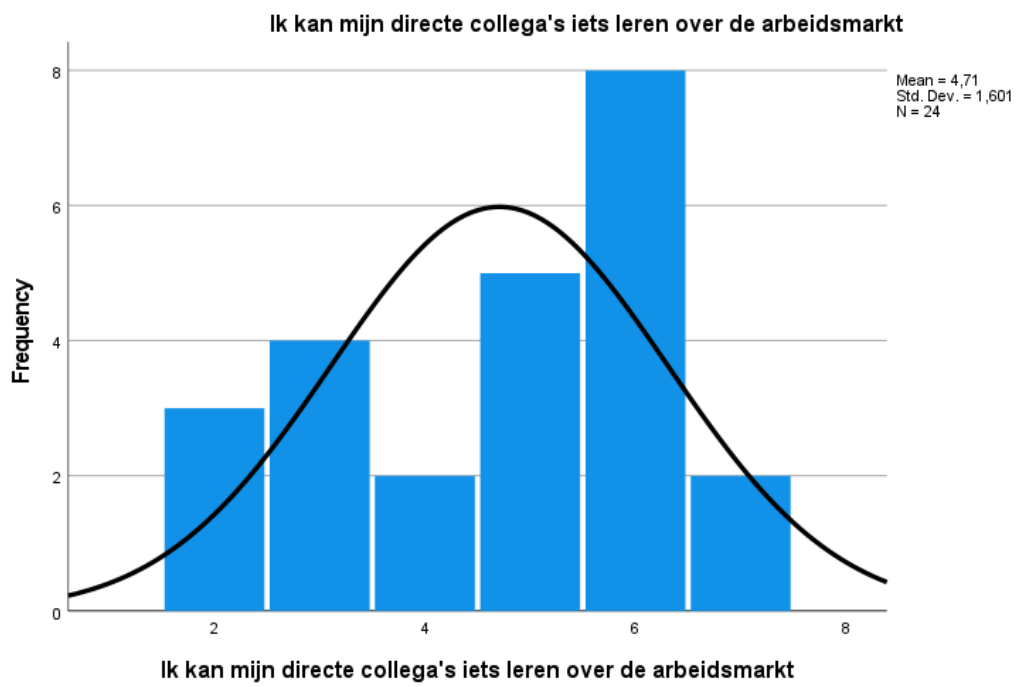
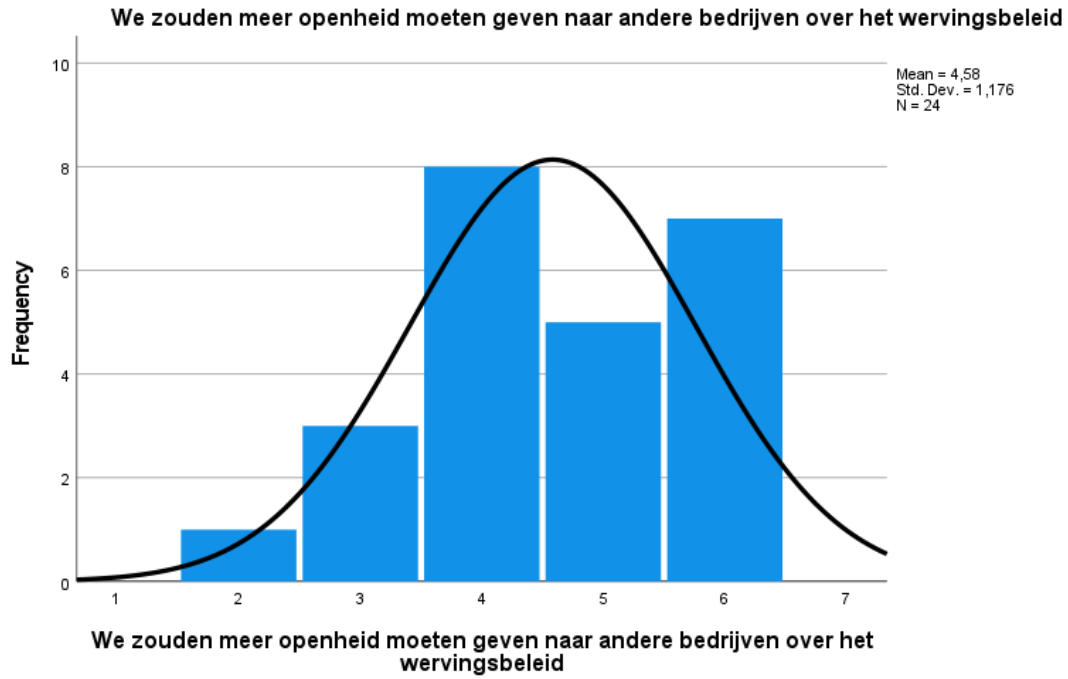


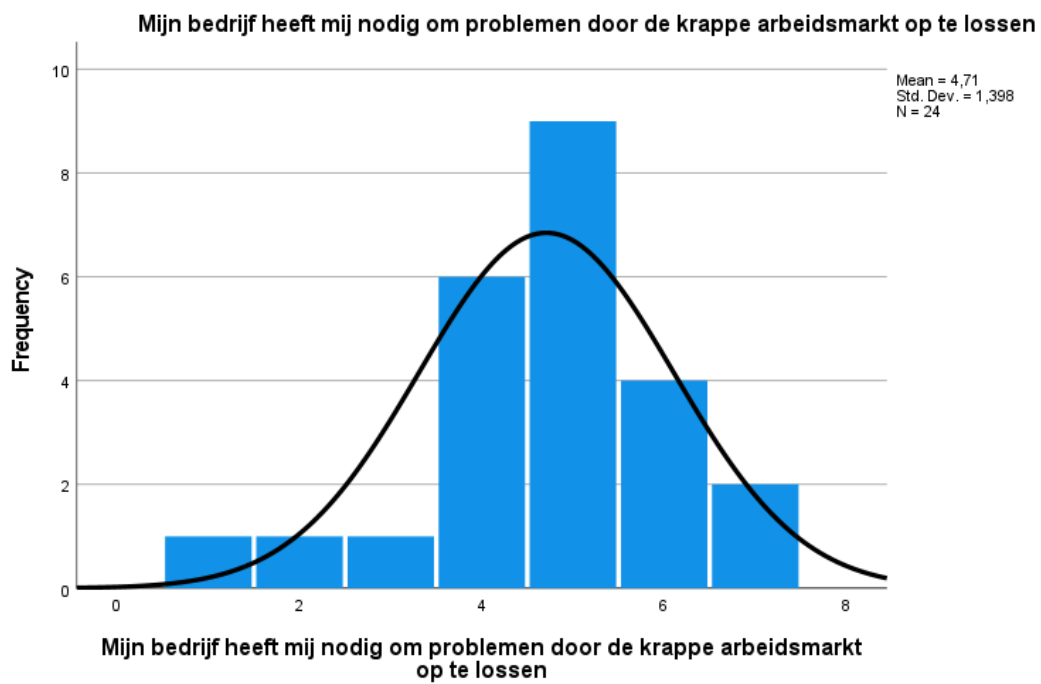
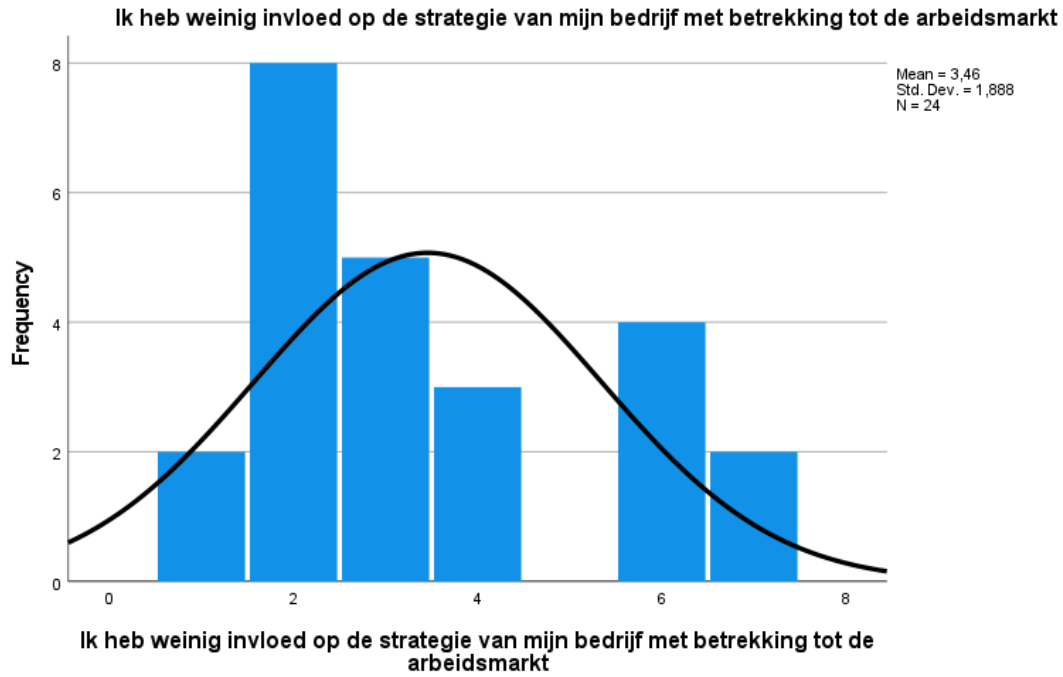
De concurrentie met andere bedrijven wordt harder in tijden van krapte op de arbeidsmarkt



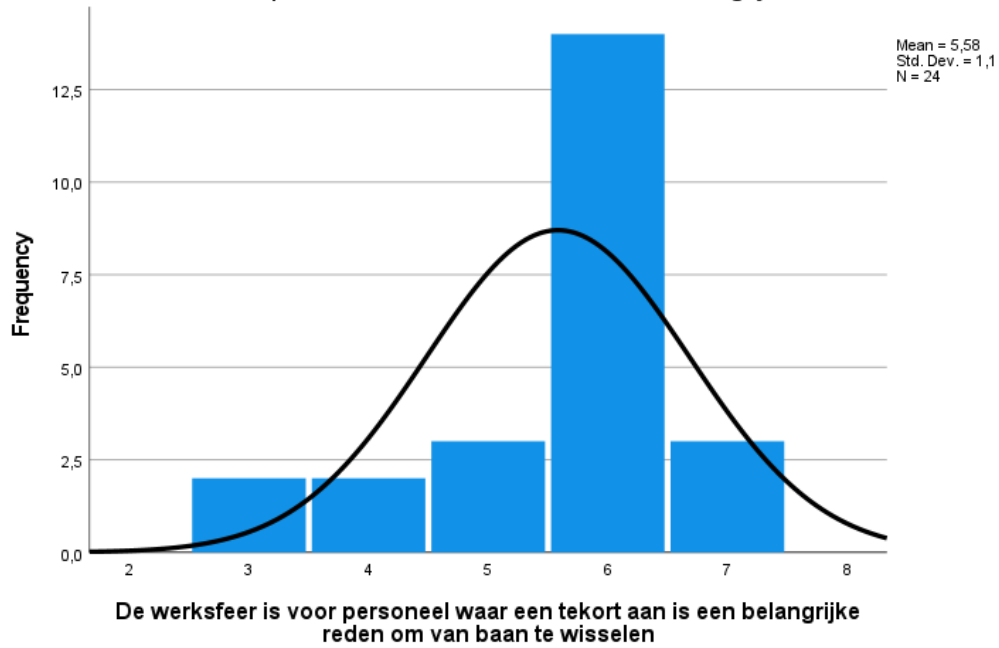
Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt



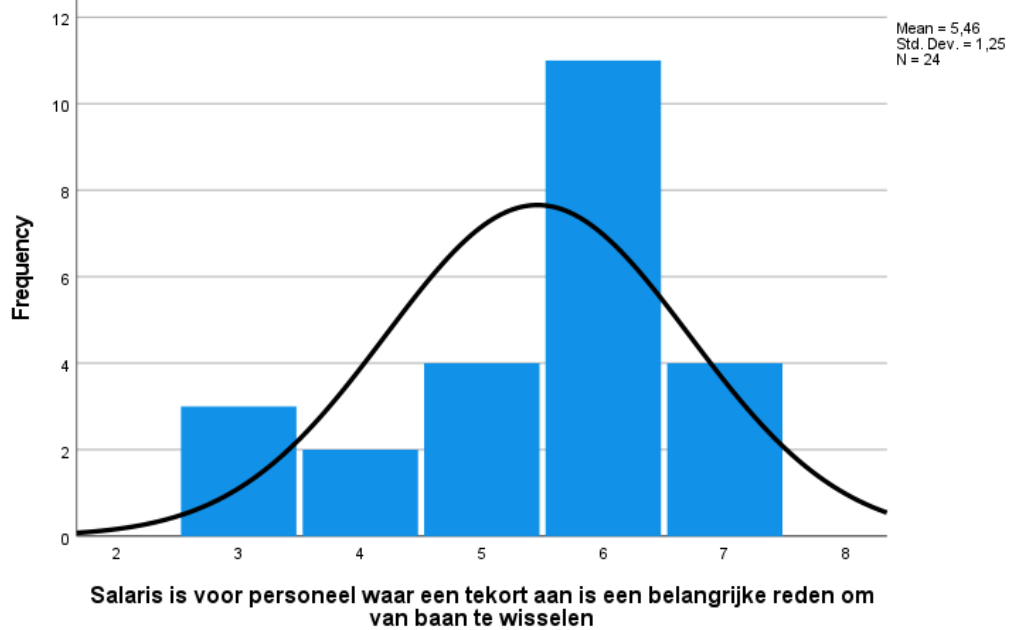




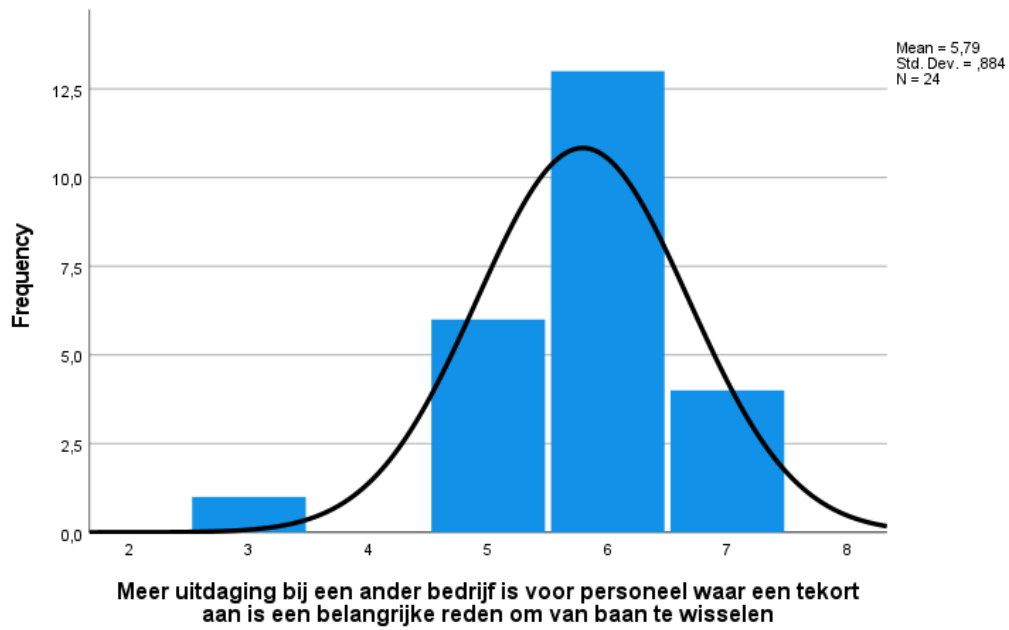
De werksfeer is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen



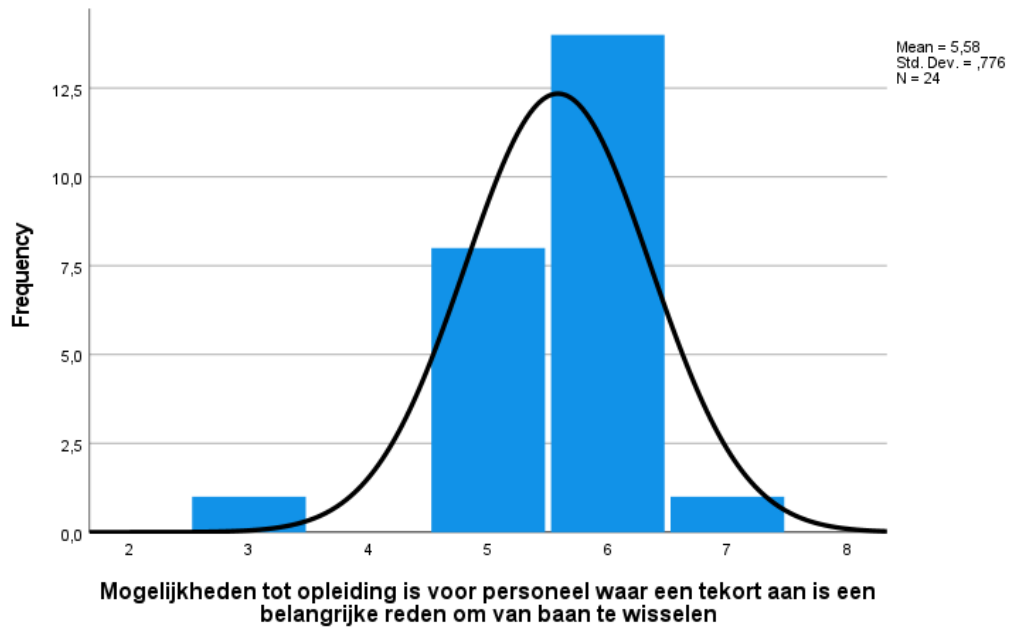
Salaris is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

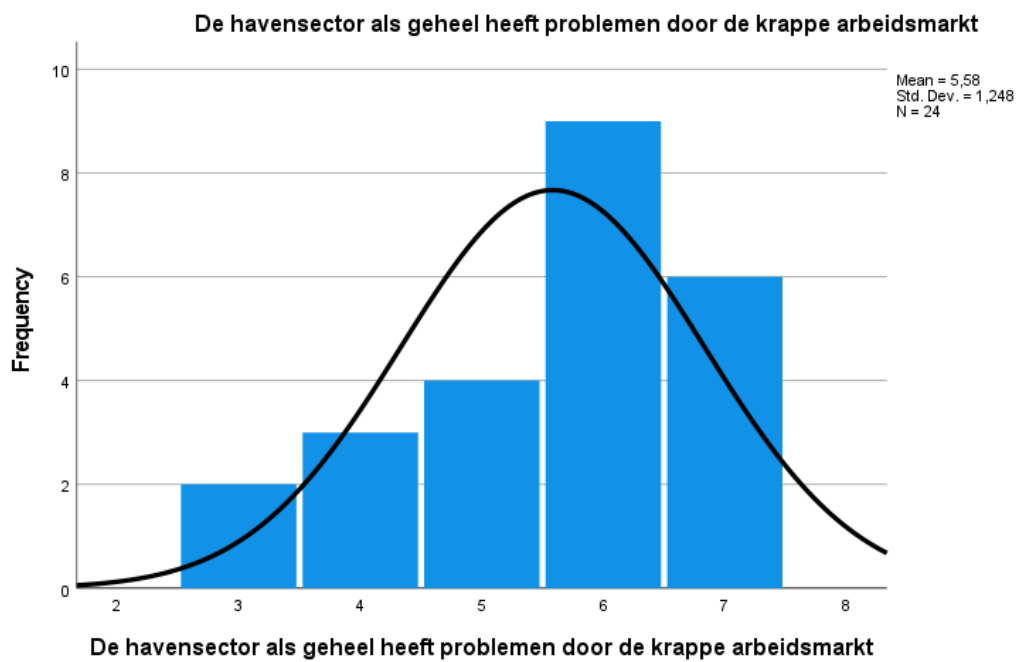
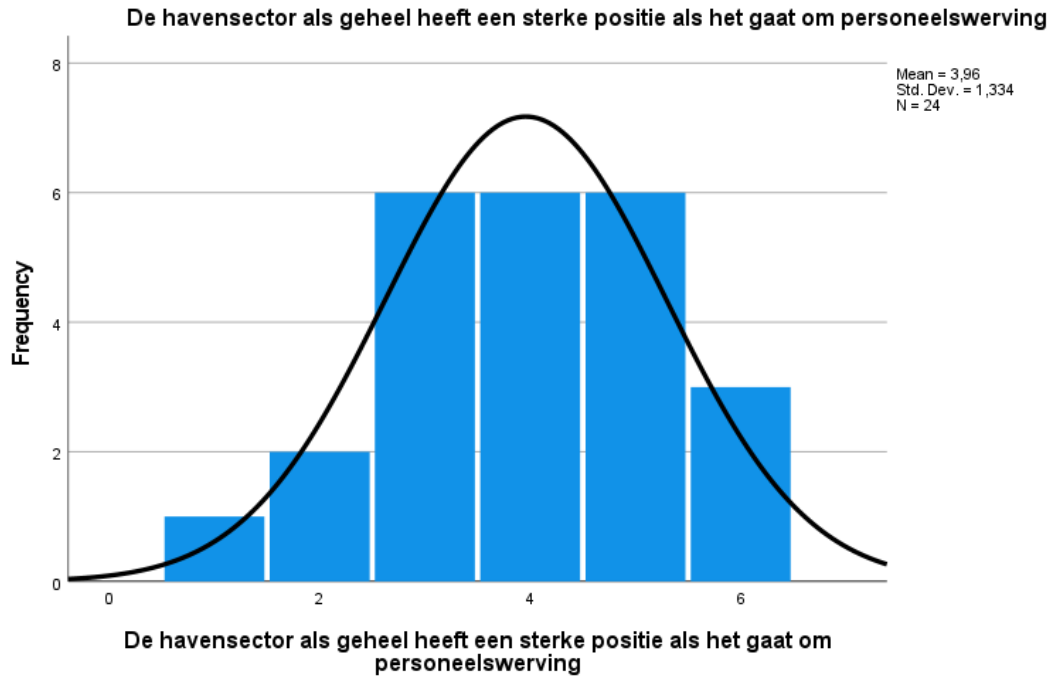


Meer uitdaging bij een ander bedrijf is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

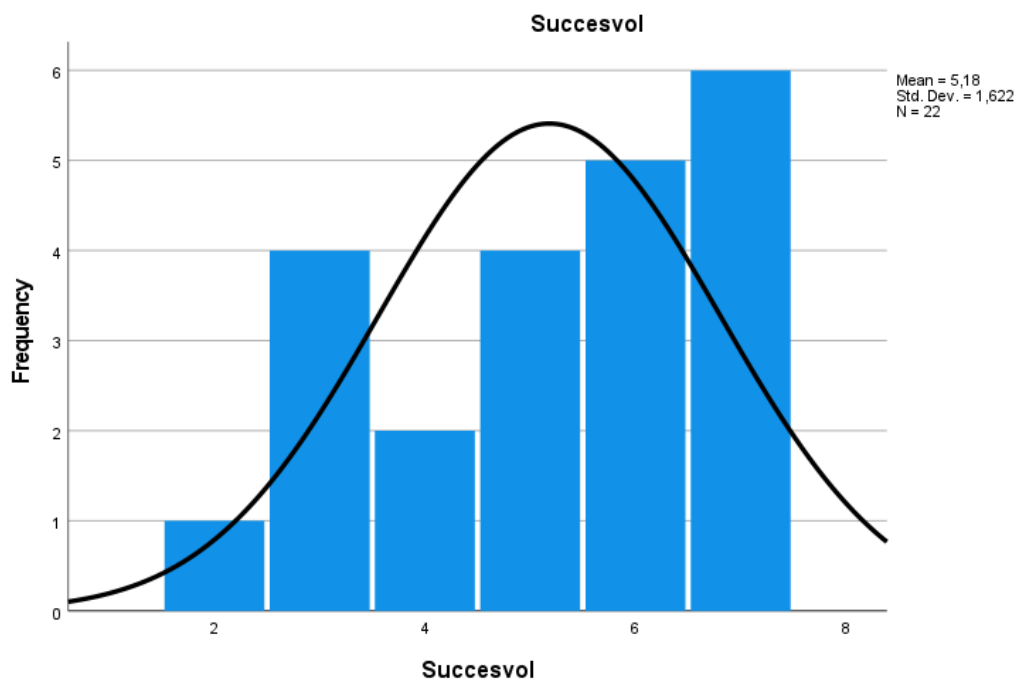
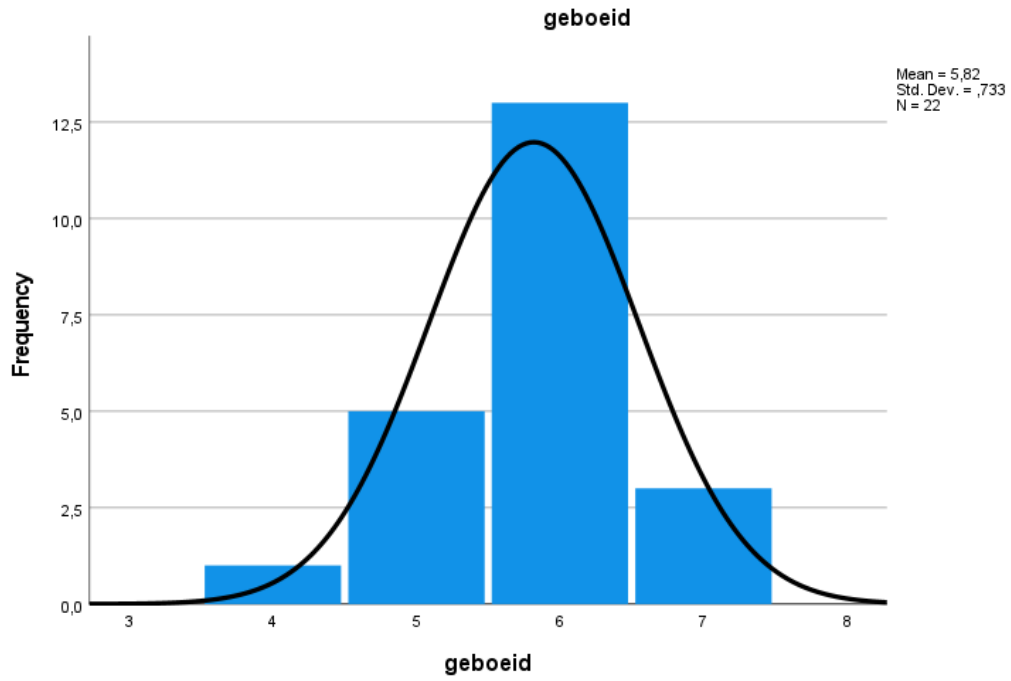


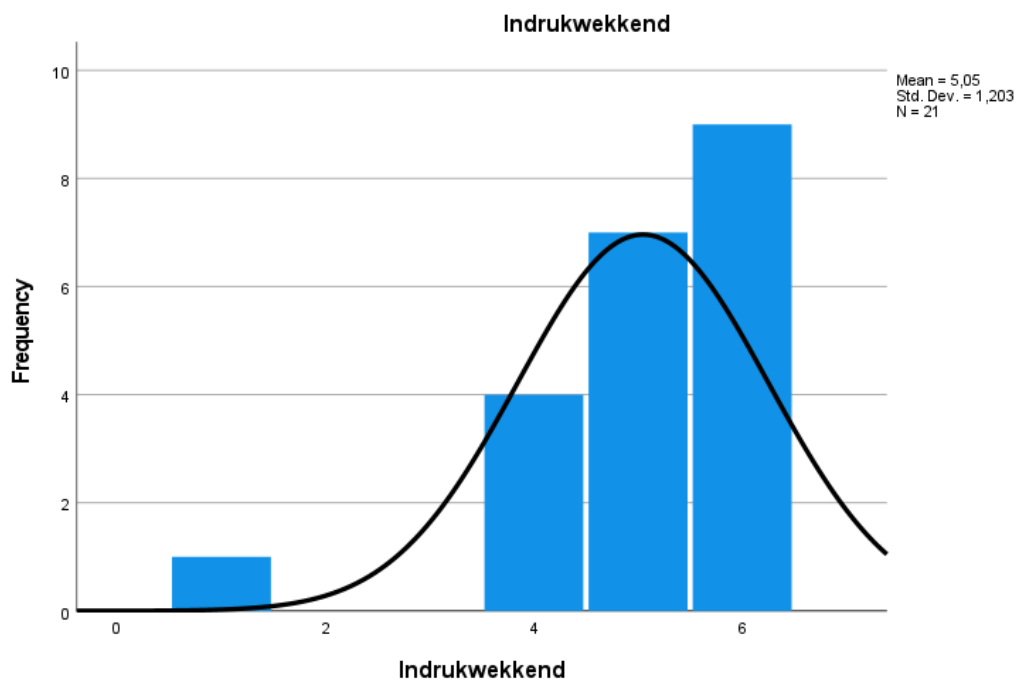
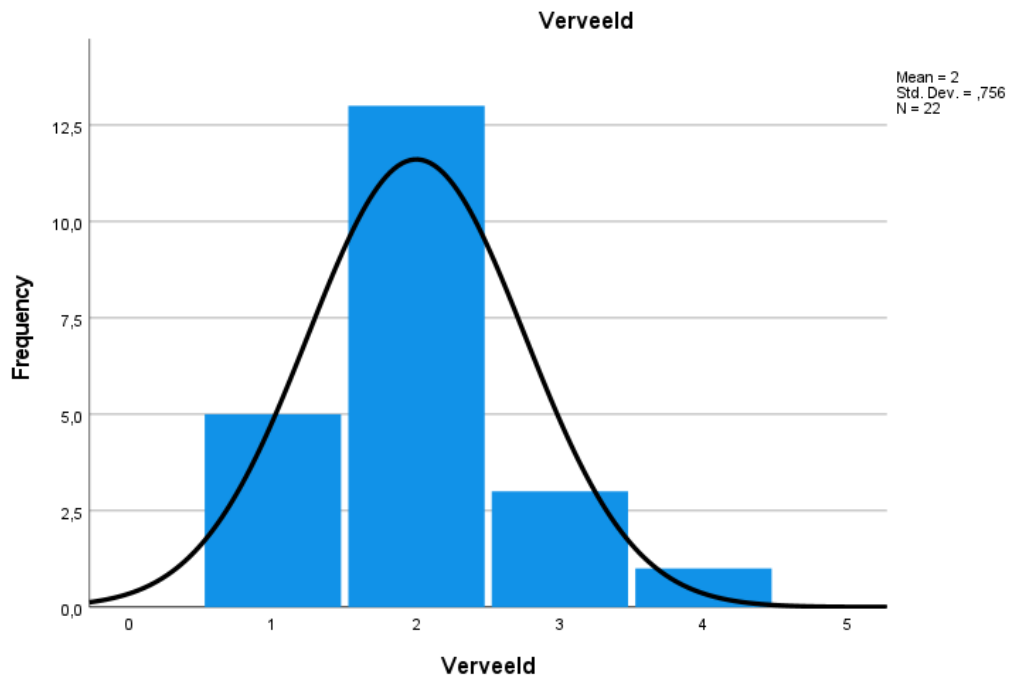
Mogelijkheden tot opleiding is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen

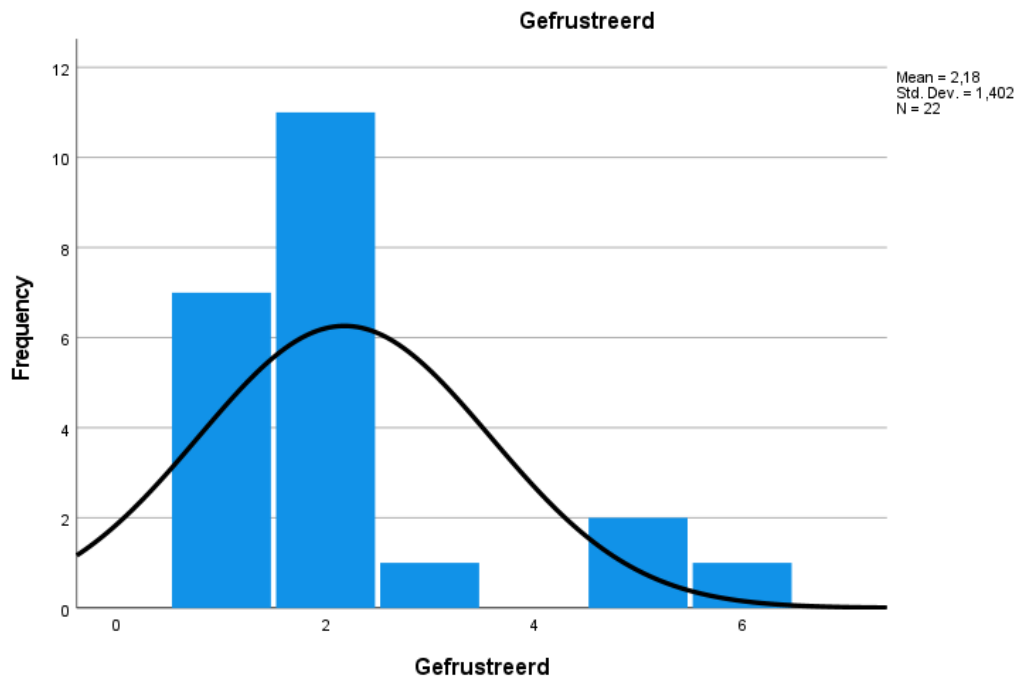
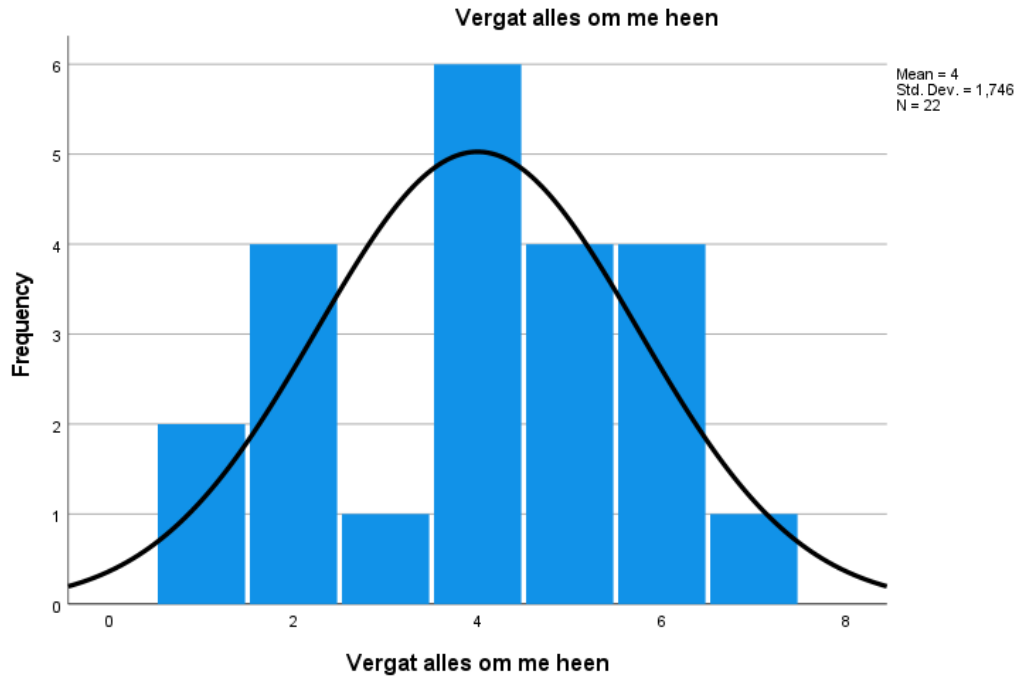


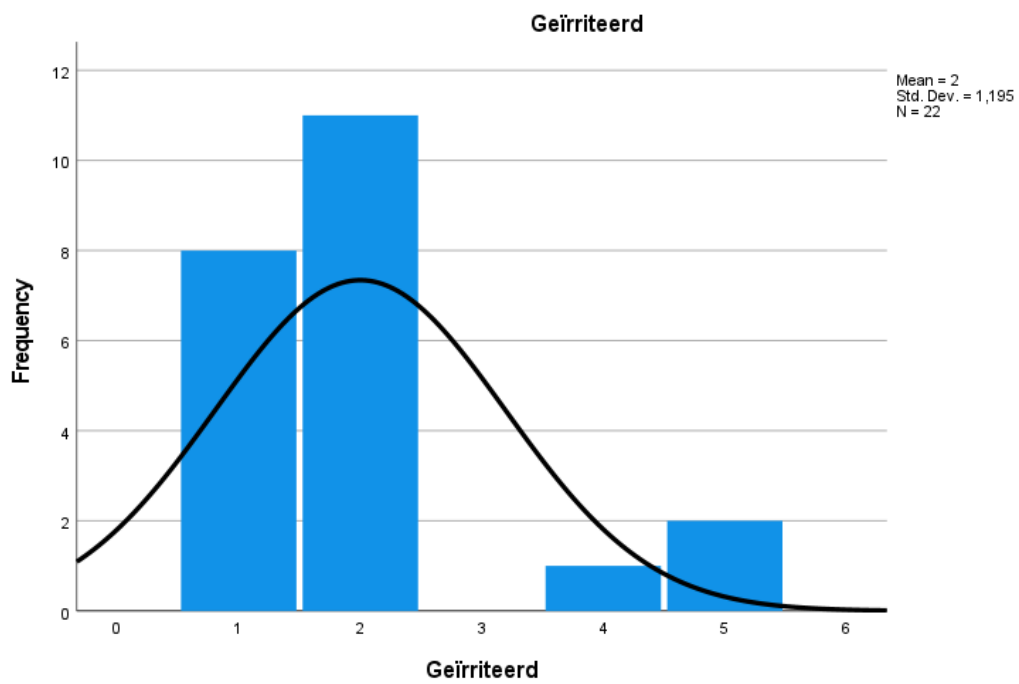
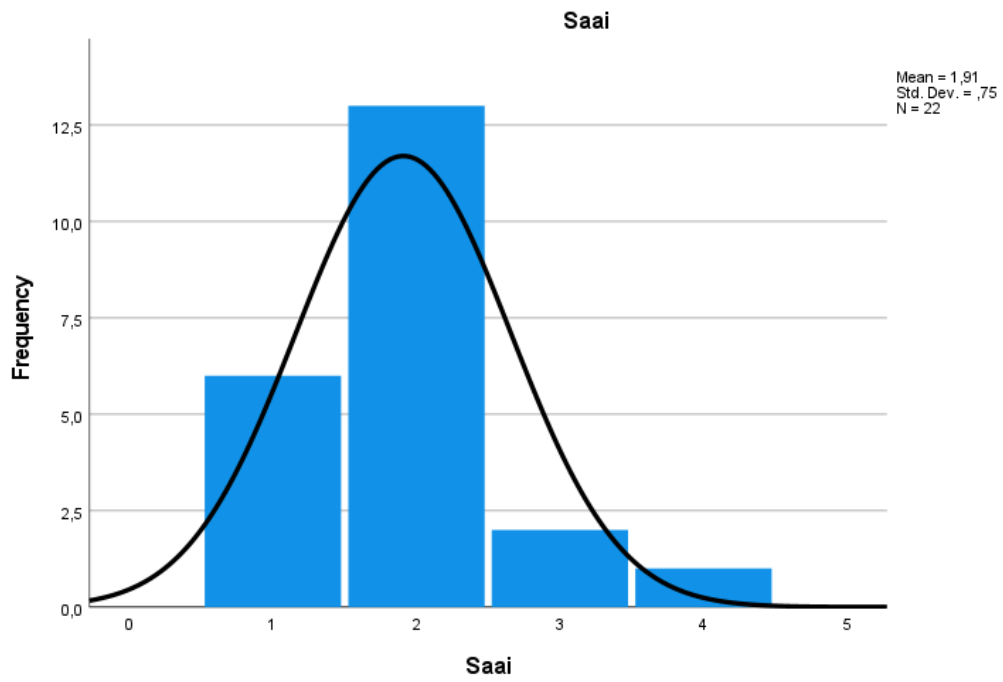


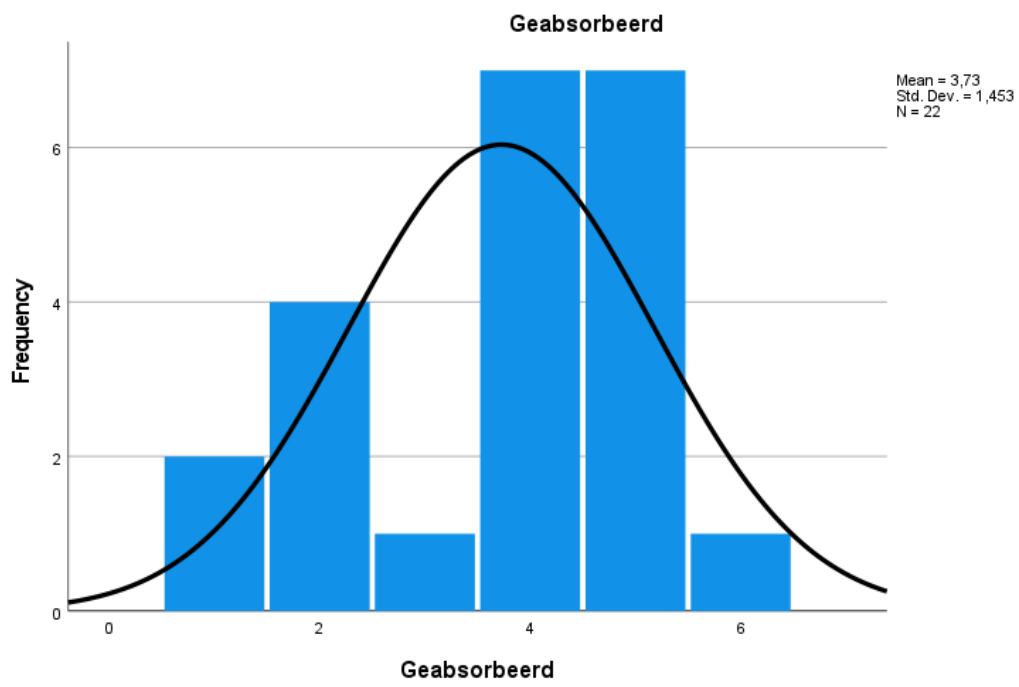
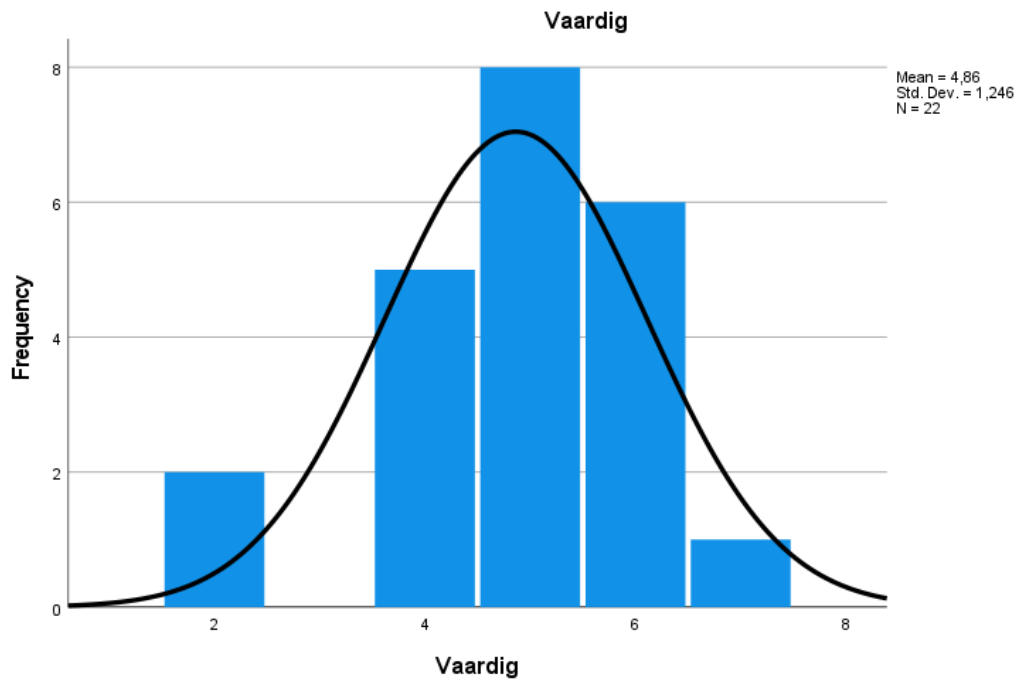
Post-survey

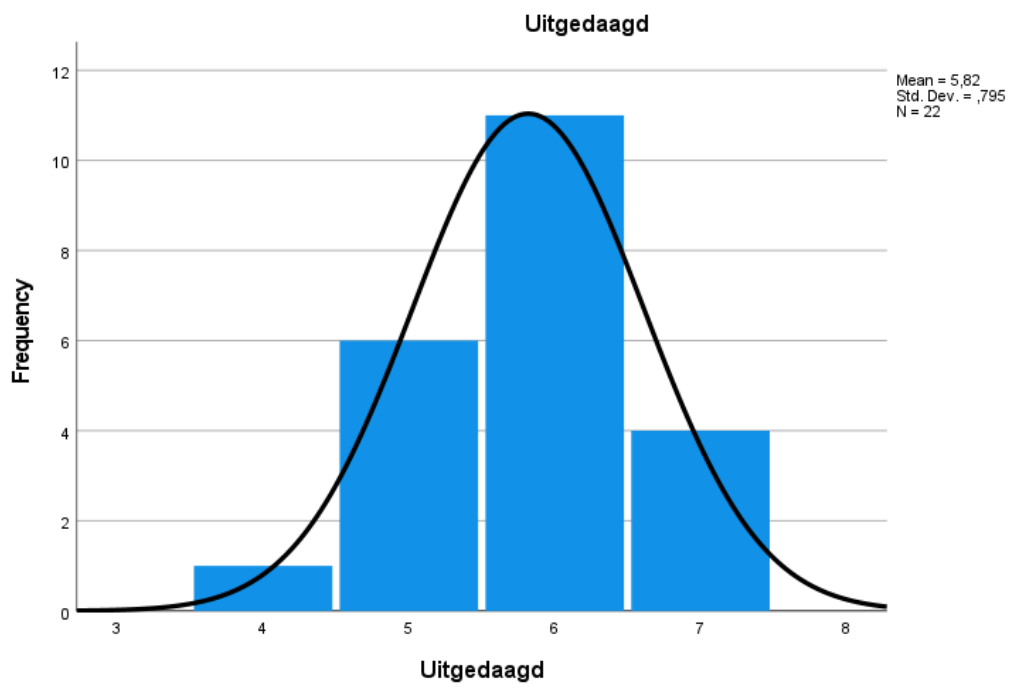
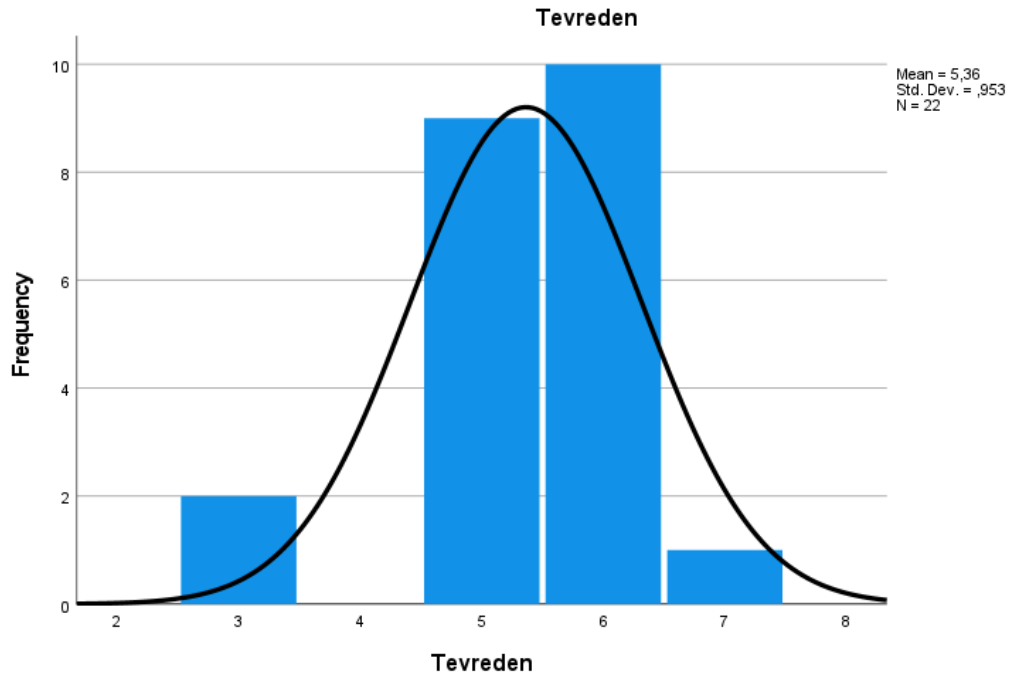


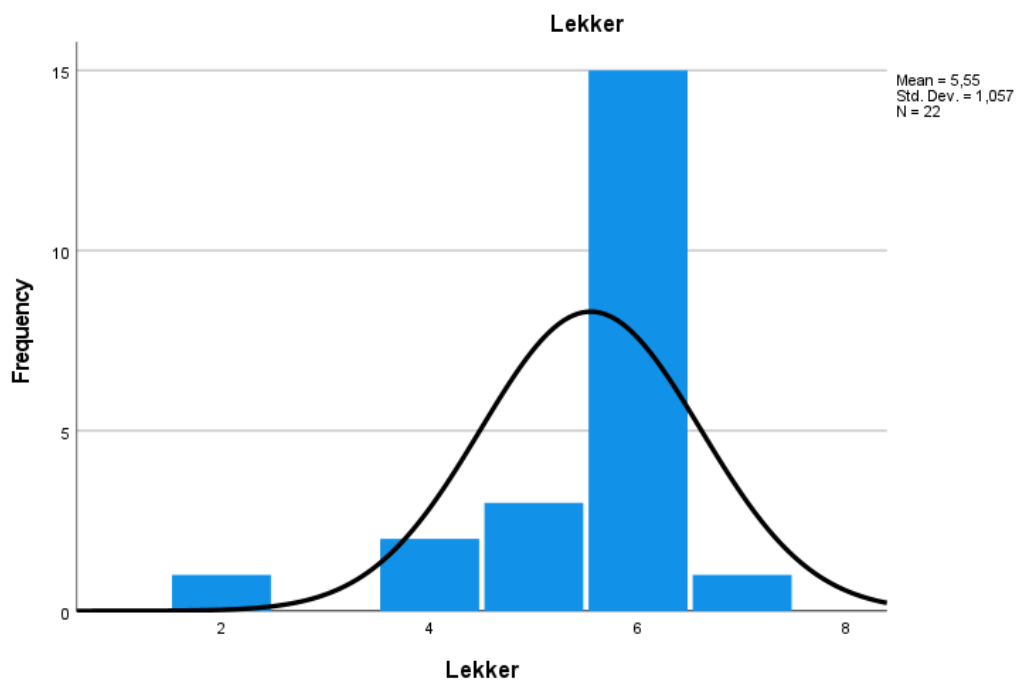
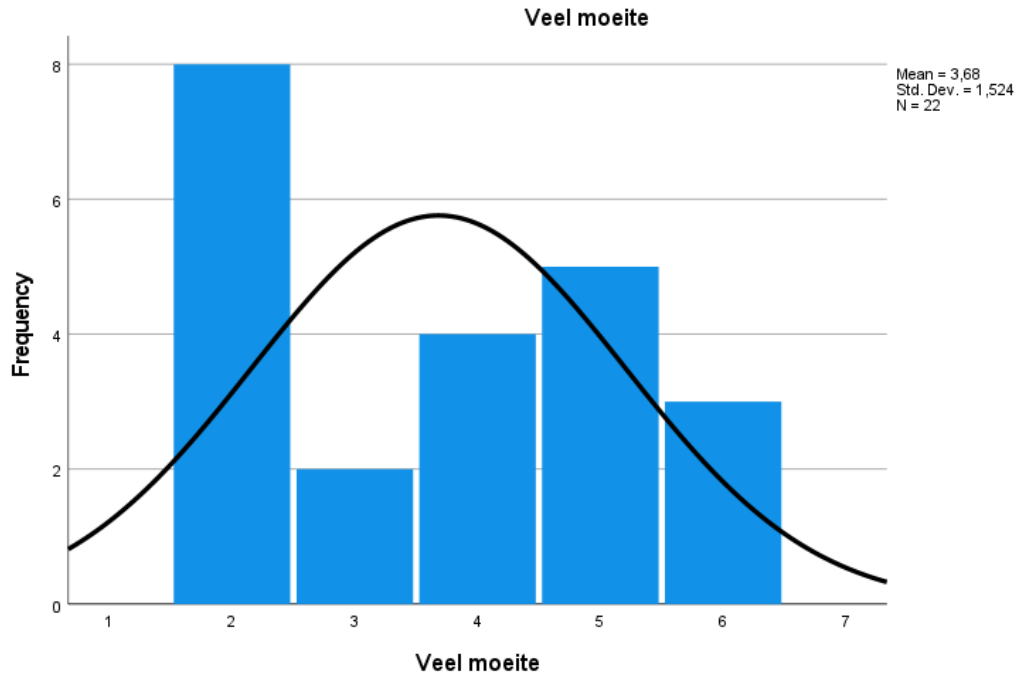




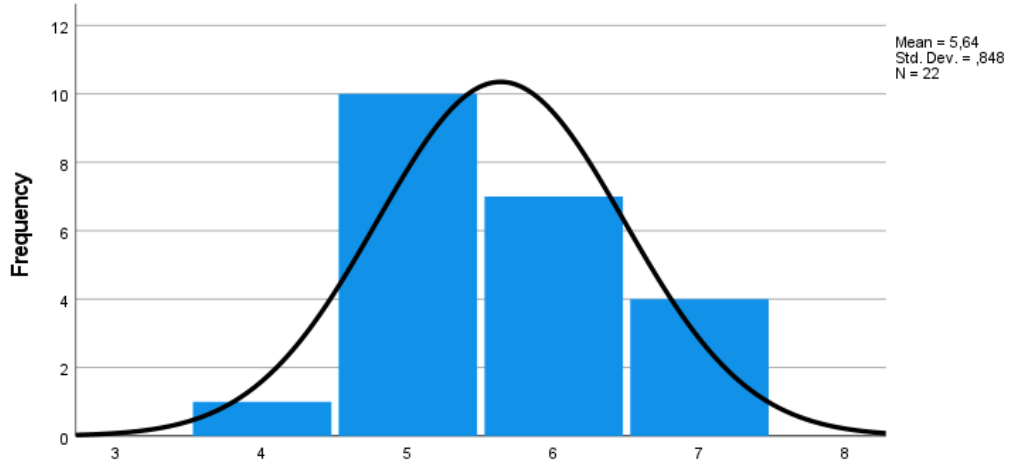




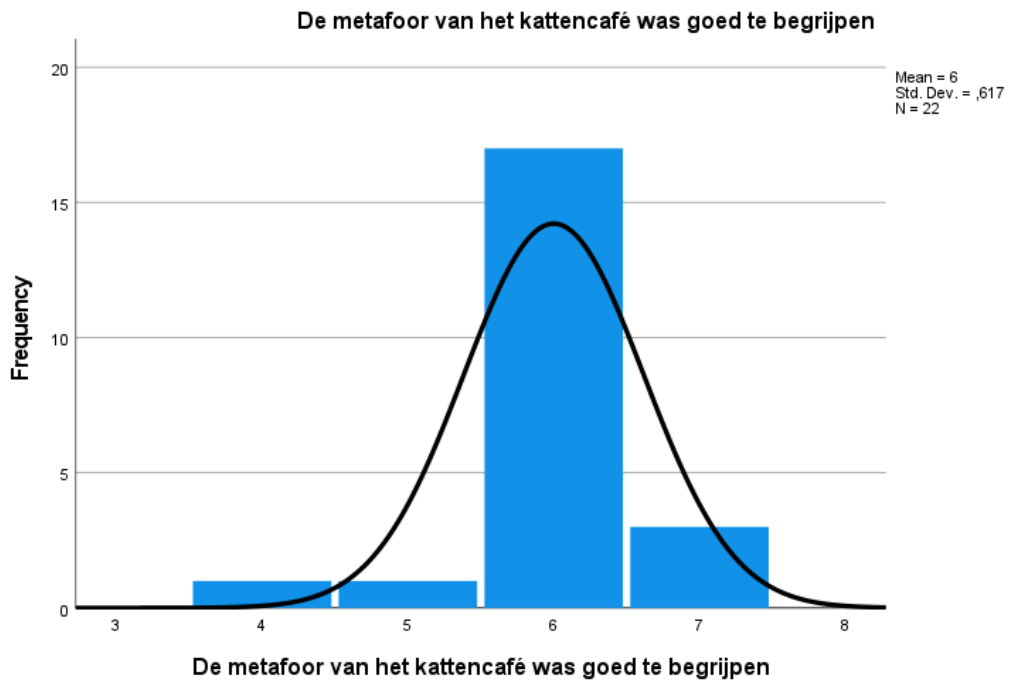


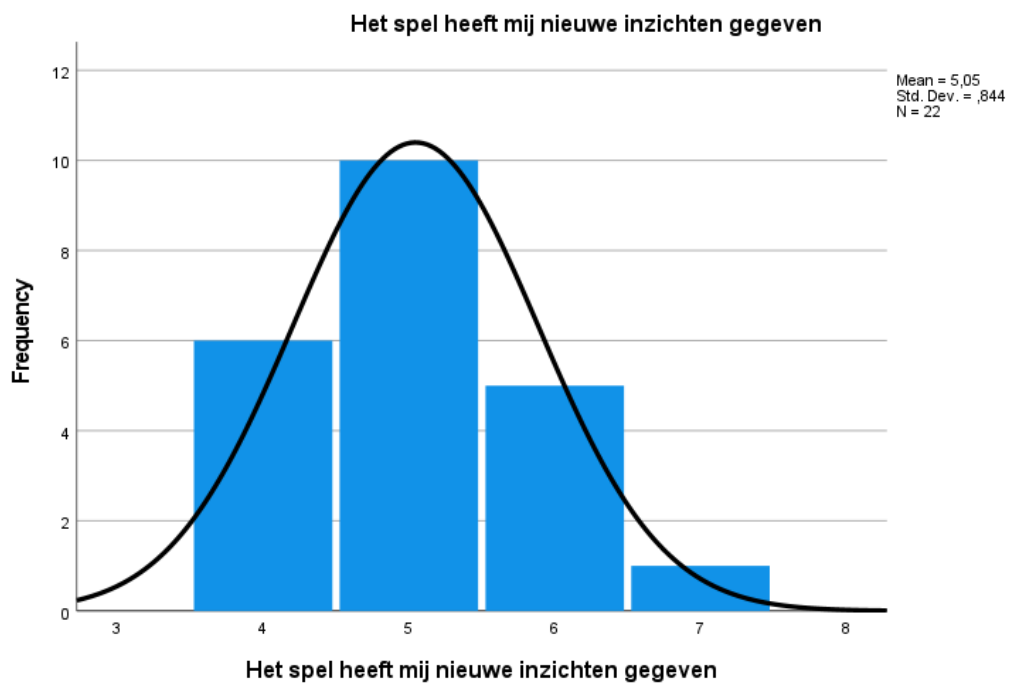
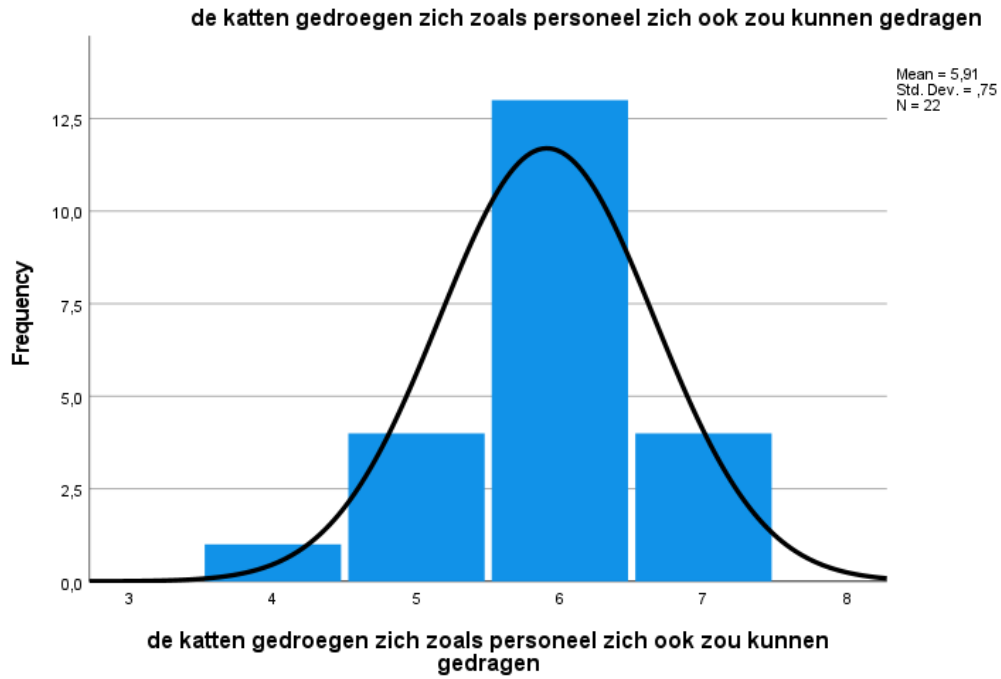


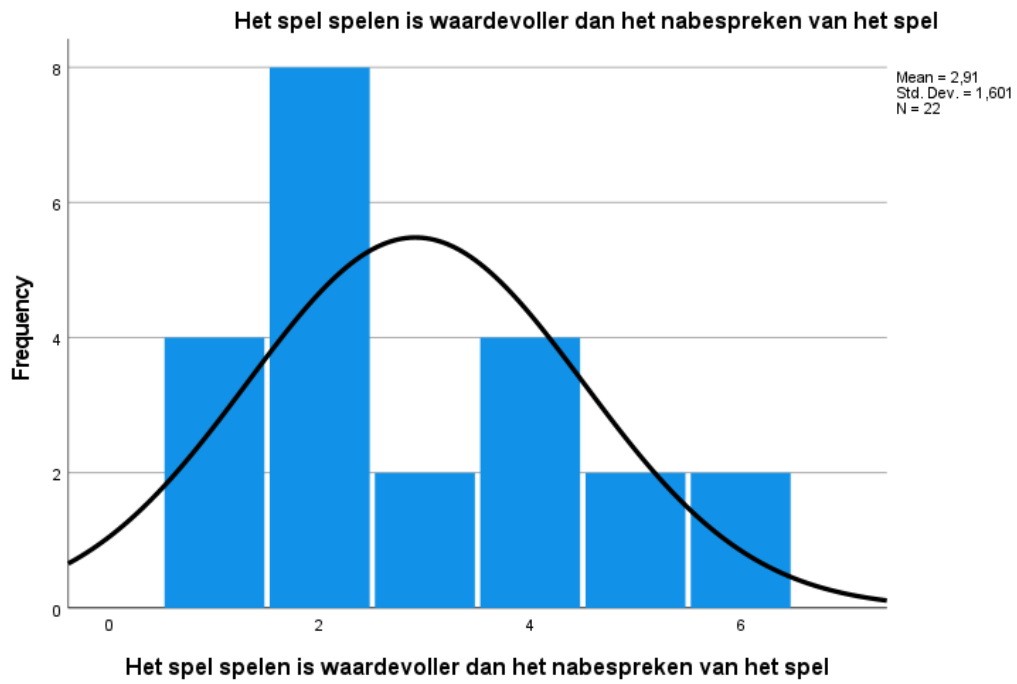
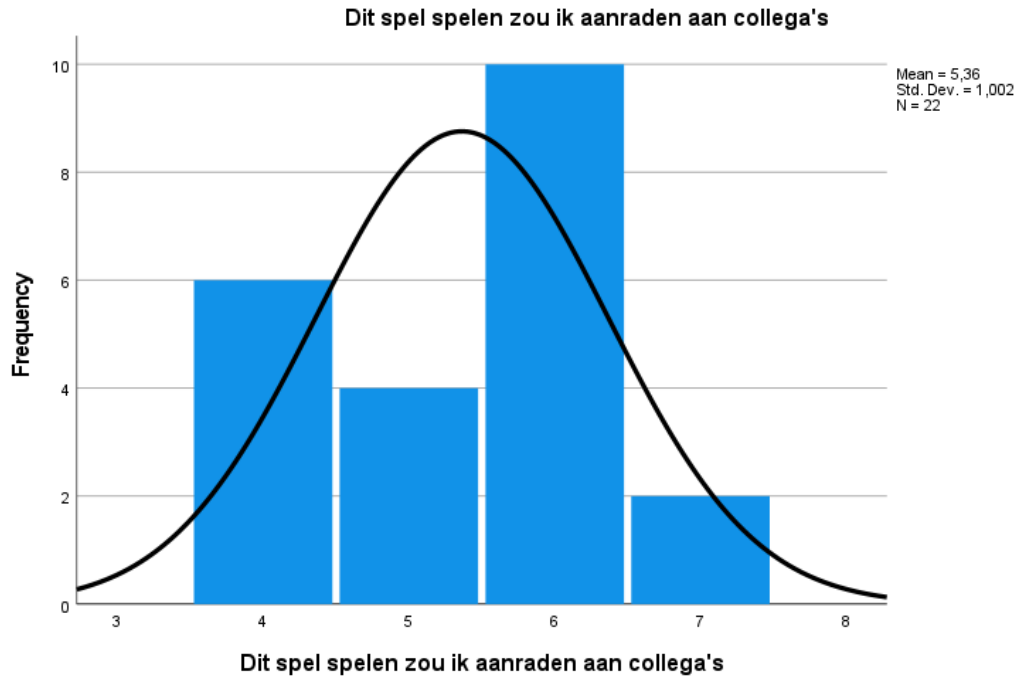
De volgende stellingen gaan over de game.
Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.
Het spel laat je goed reflecteren op uitdagingen van de arbeidsmarkt

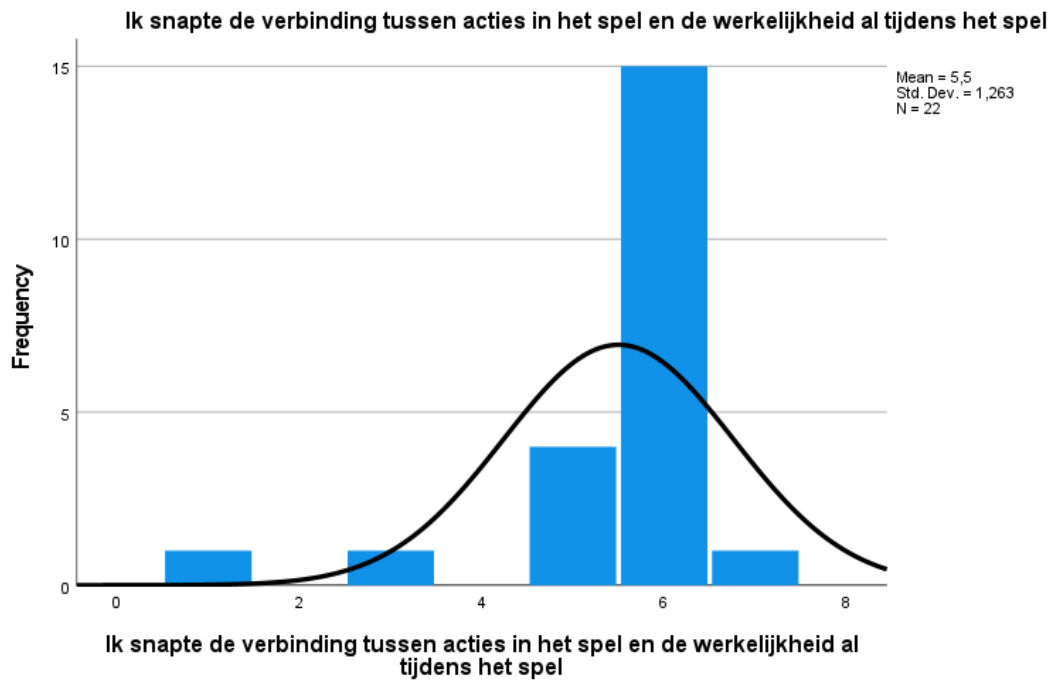
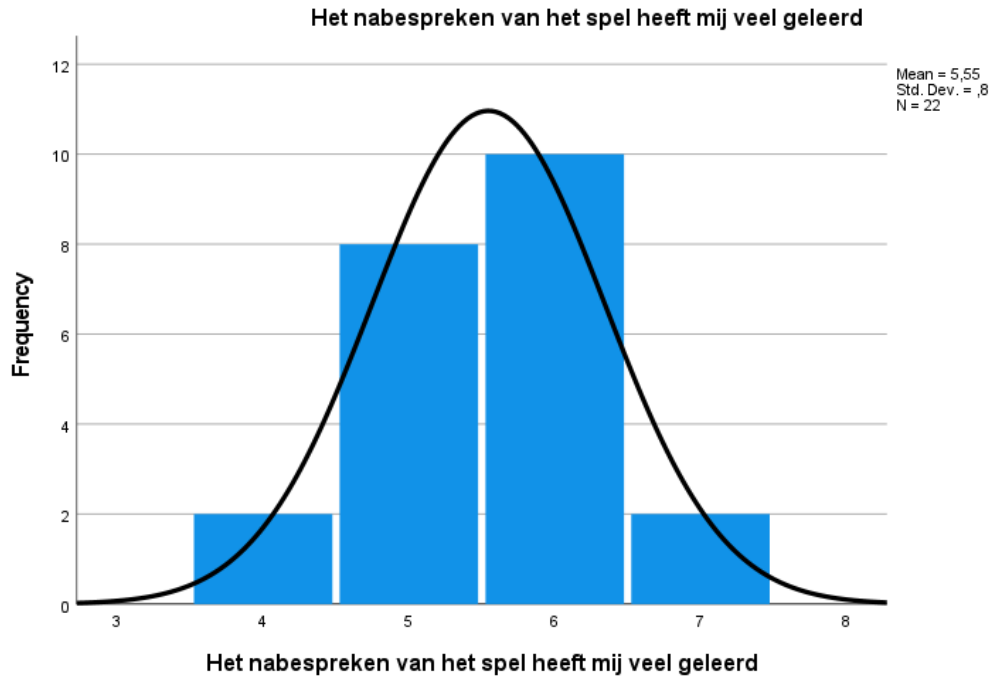


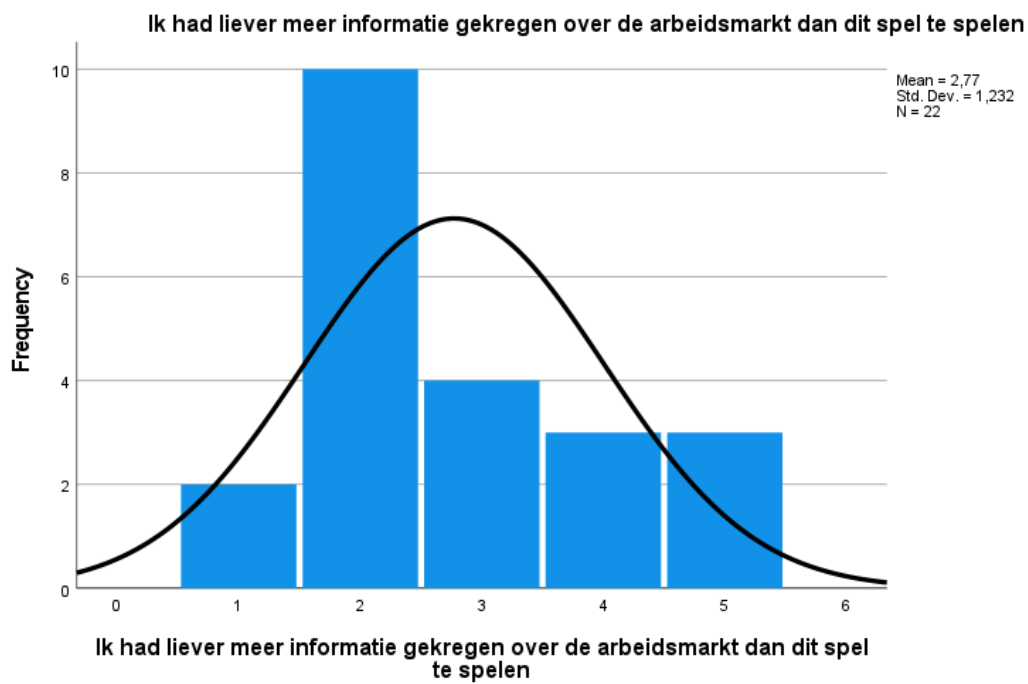
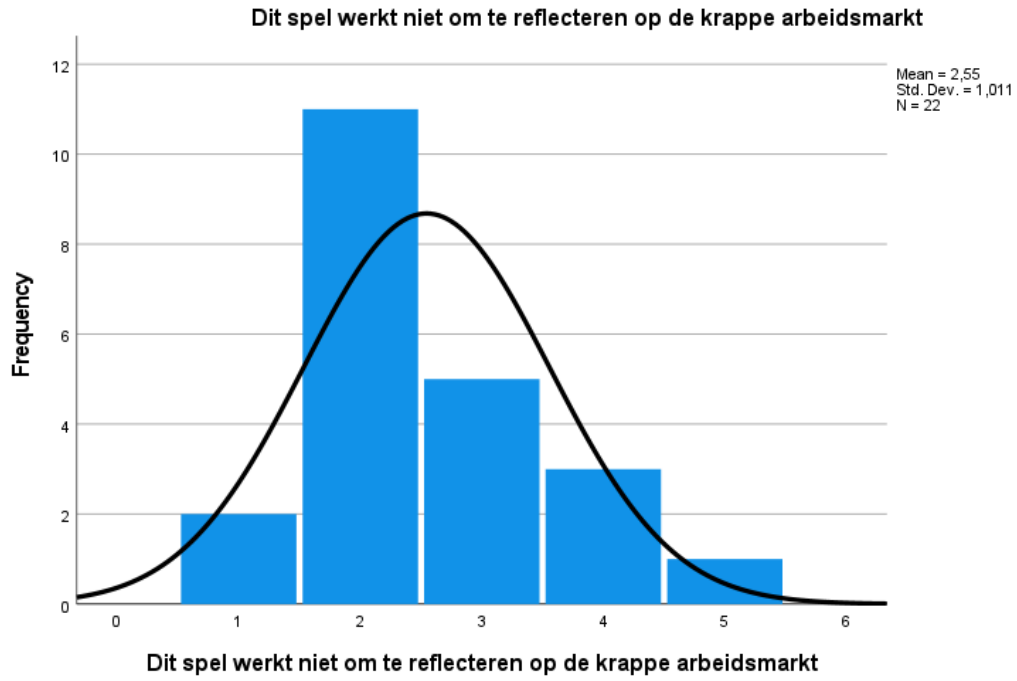
De volgende stellingen gaan over de game.
Geef bij elke stelling aan in hoeverre u het ermee eens of oneens bent.
Het spel laat je goed reflecteren op uitdagingen van de arbeidsmarkt

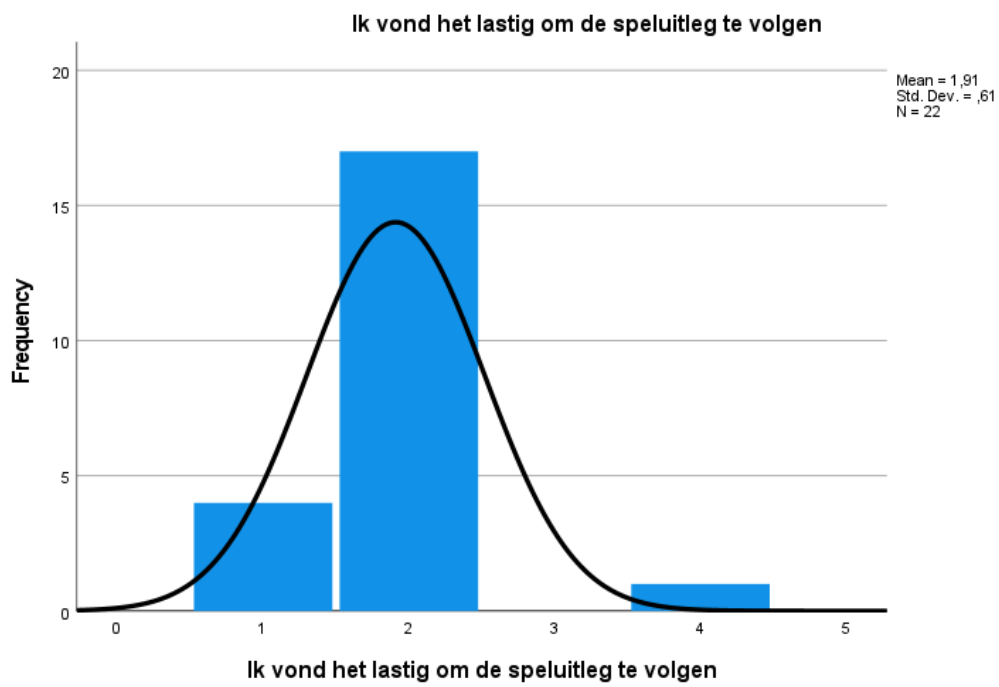
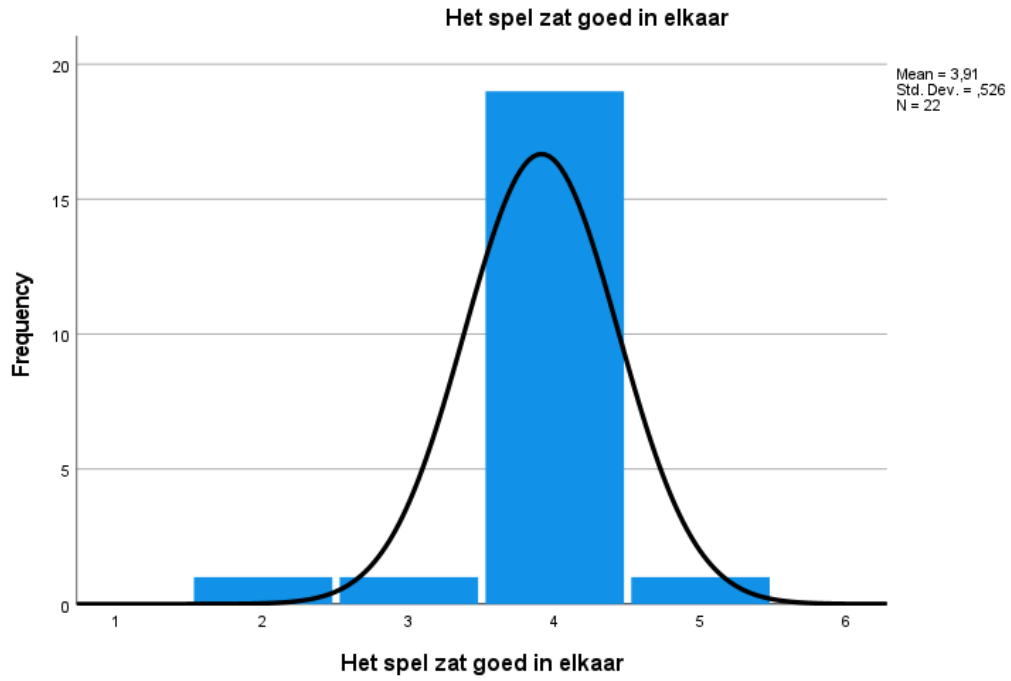


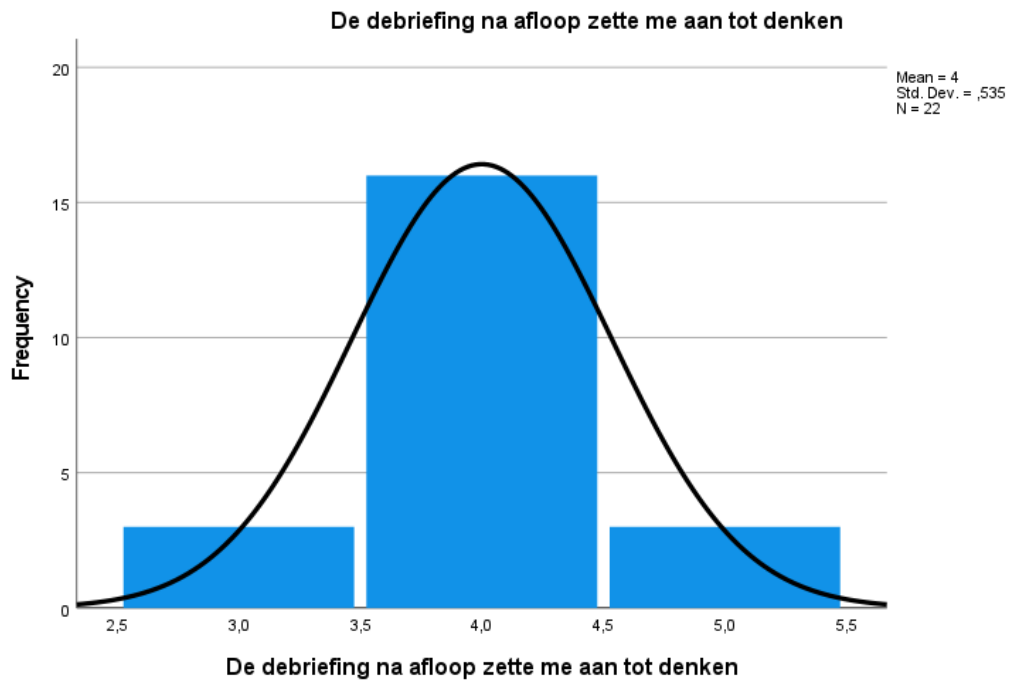
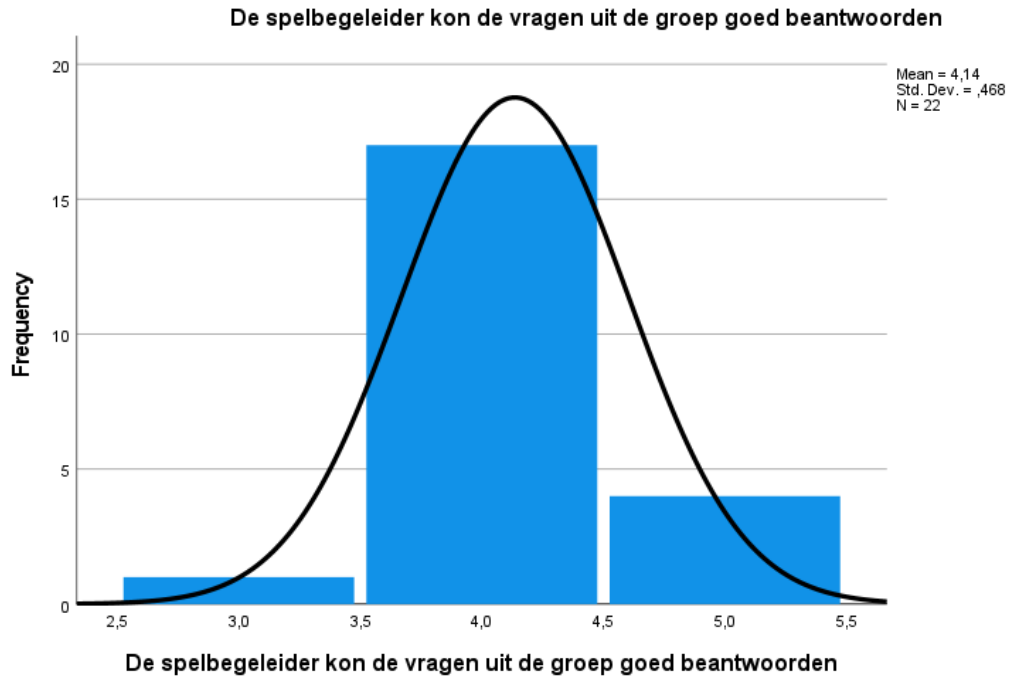


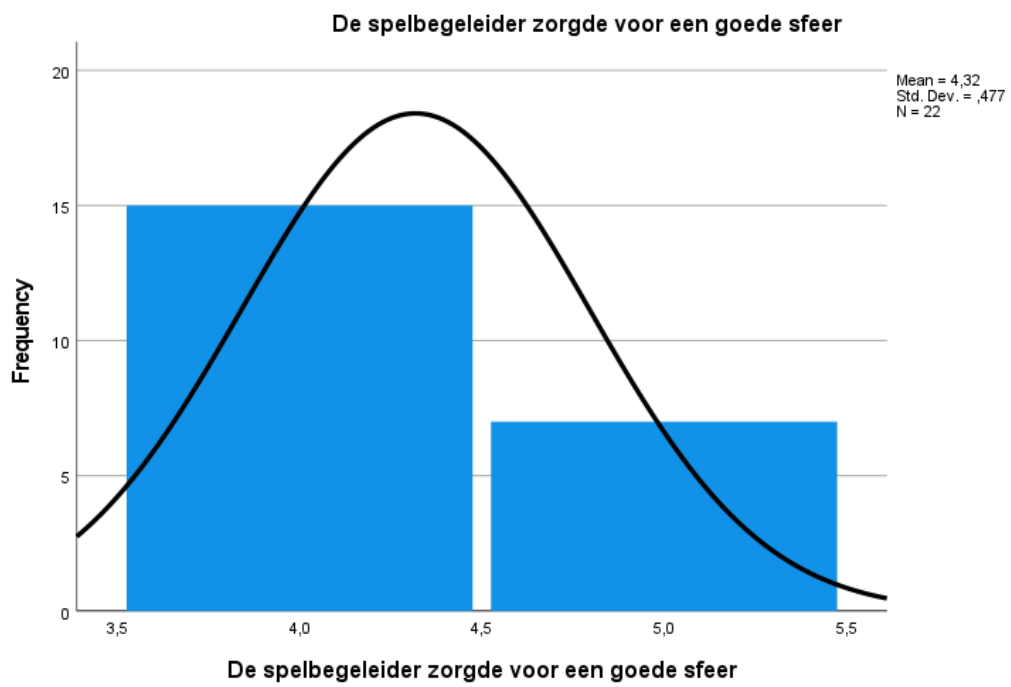
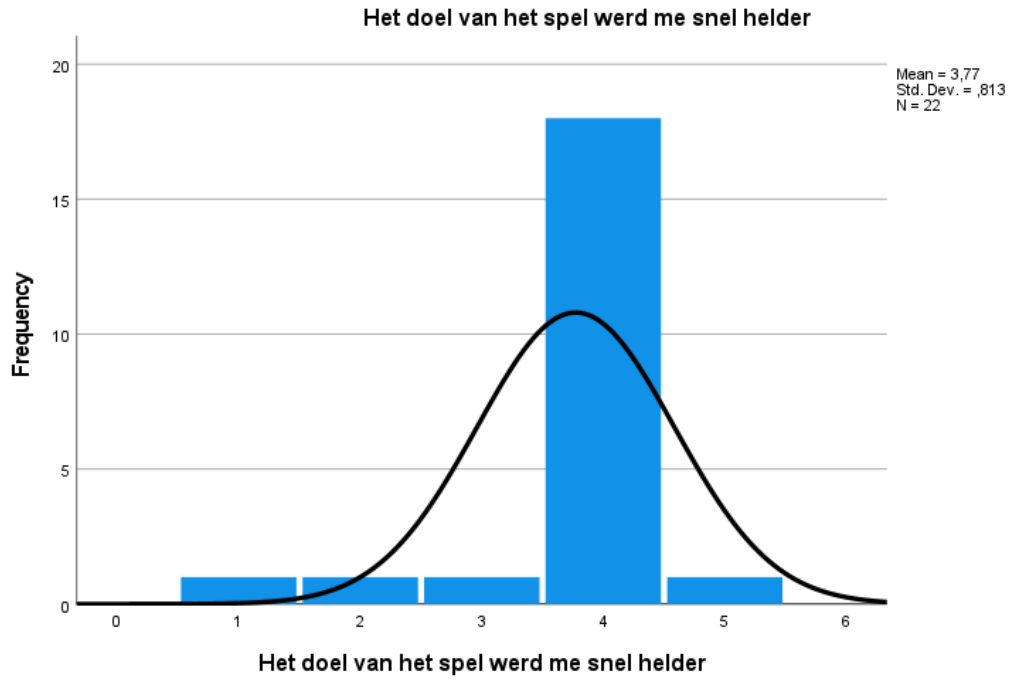


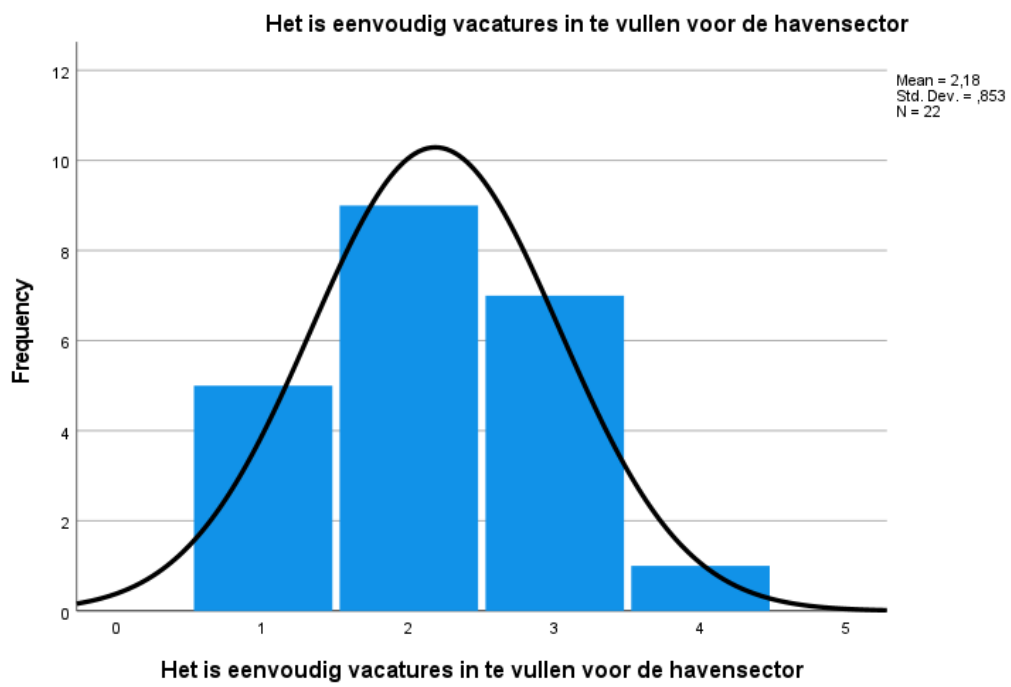
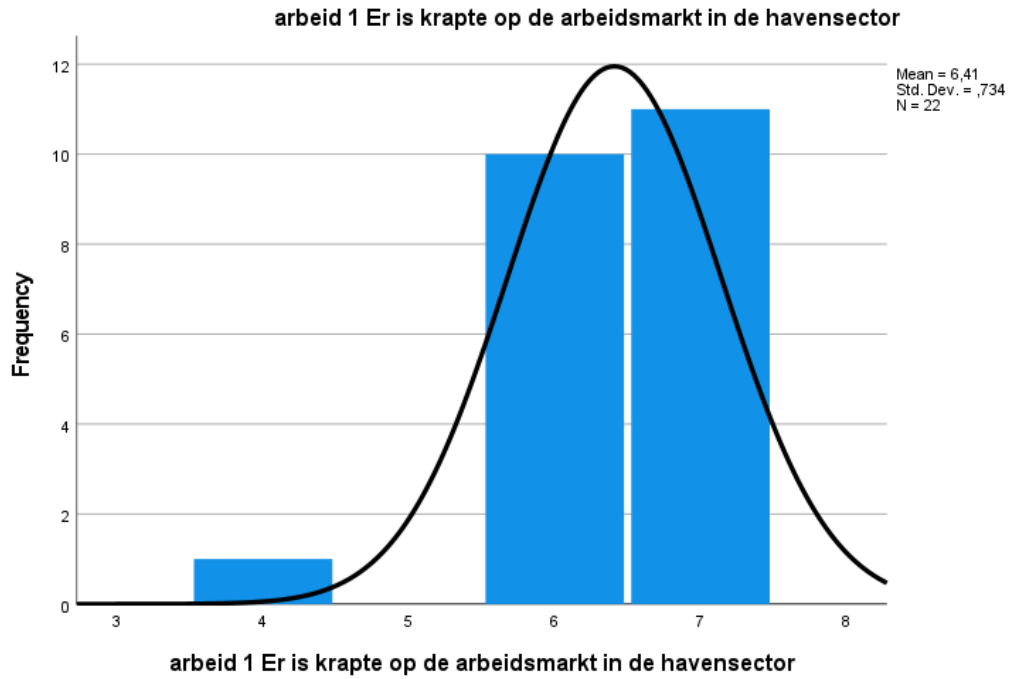


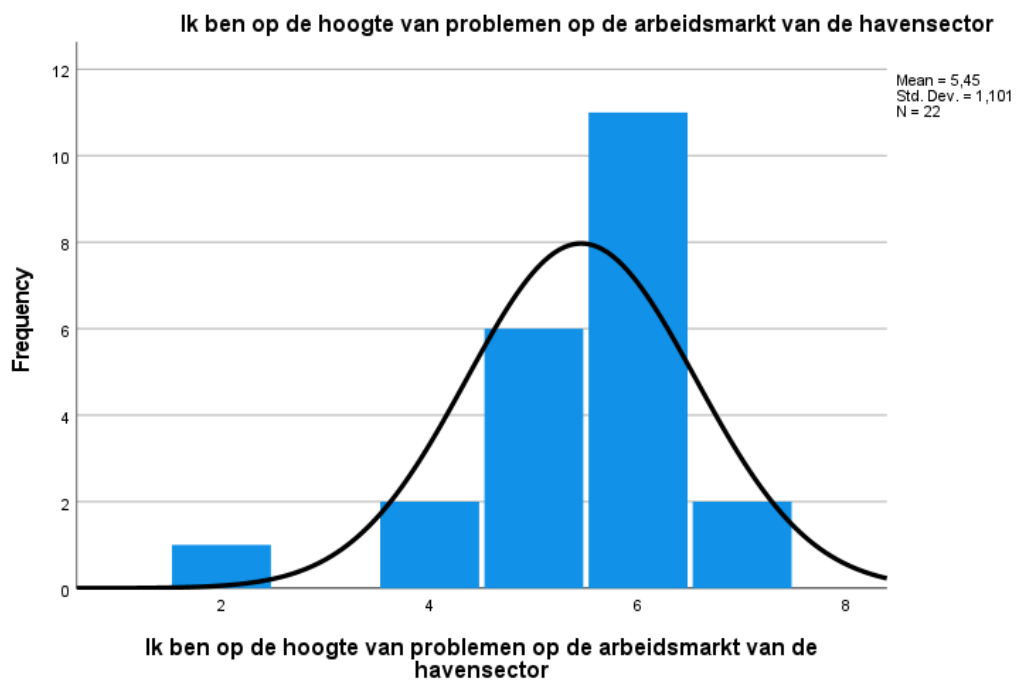
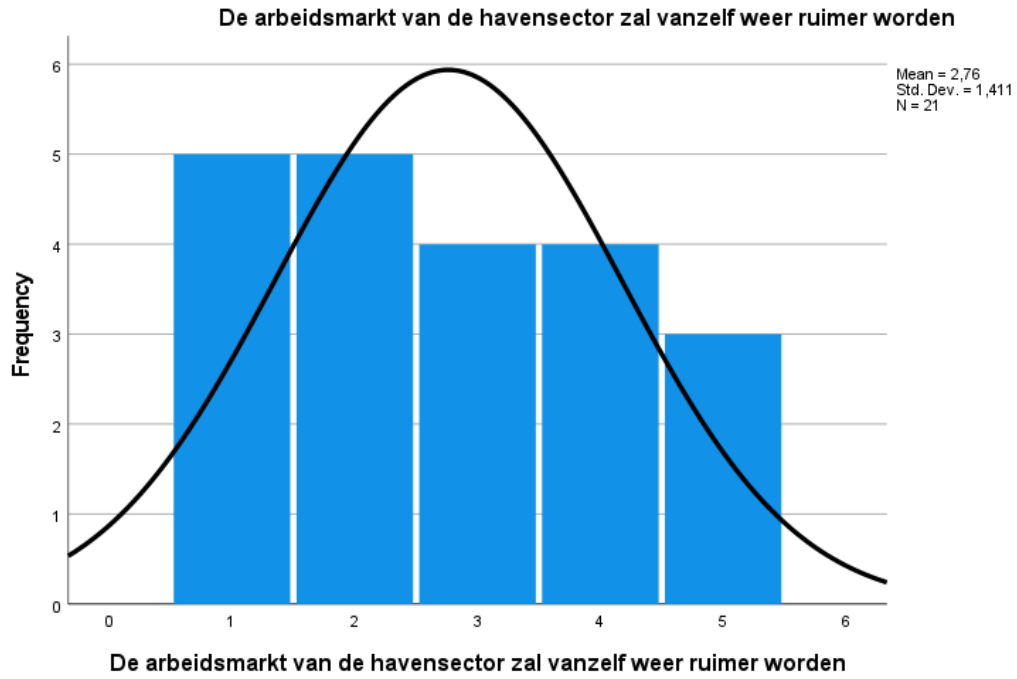


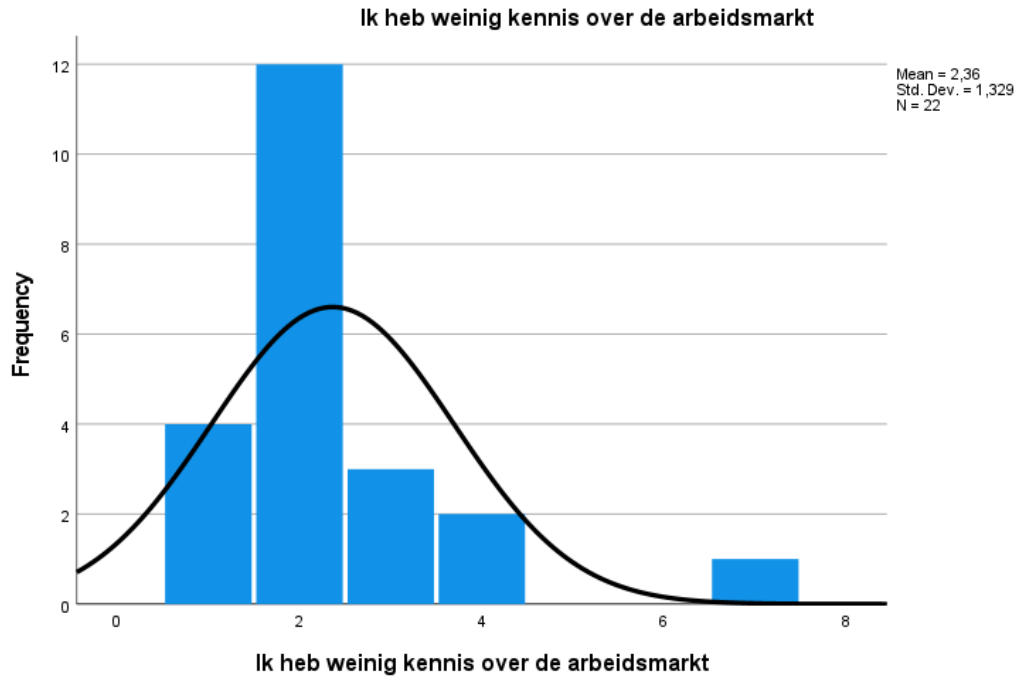




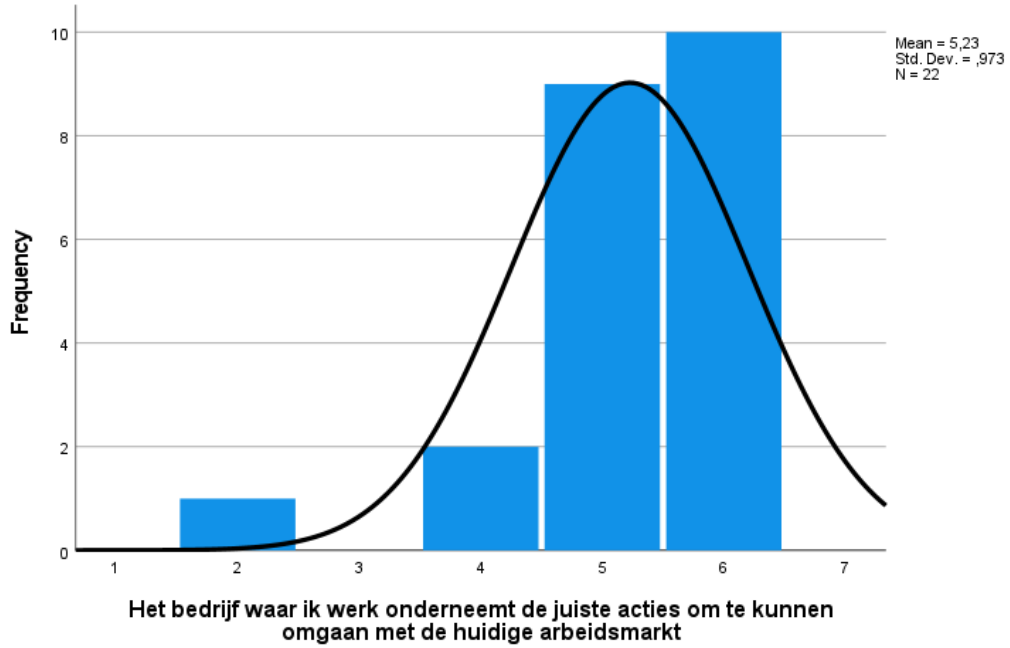




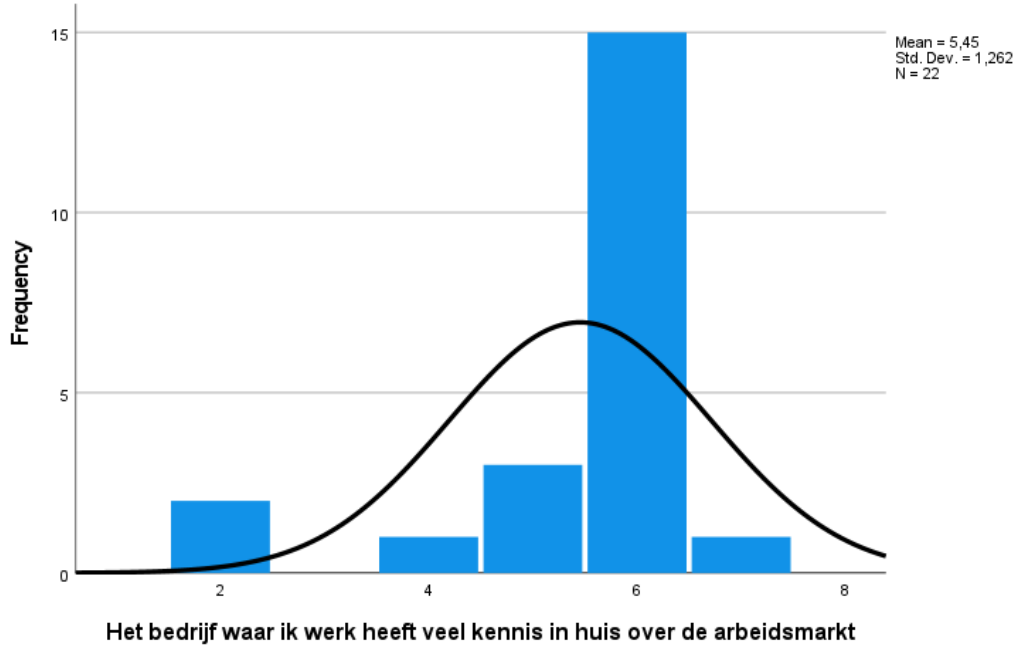


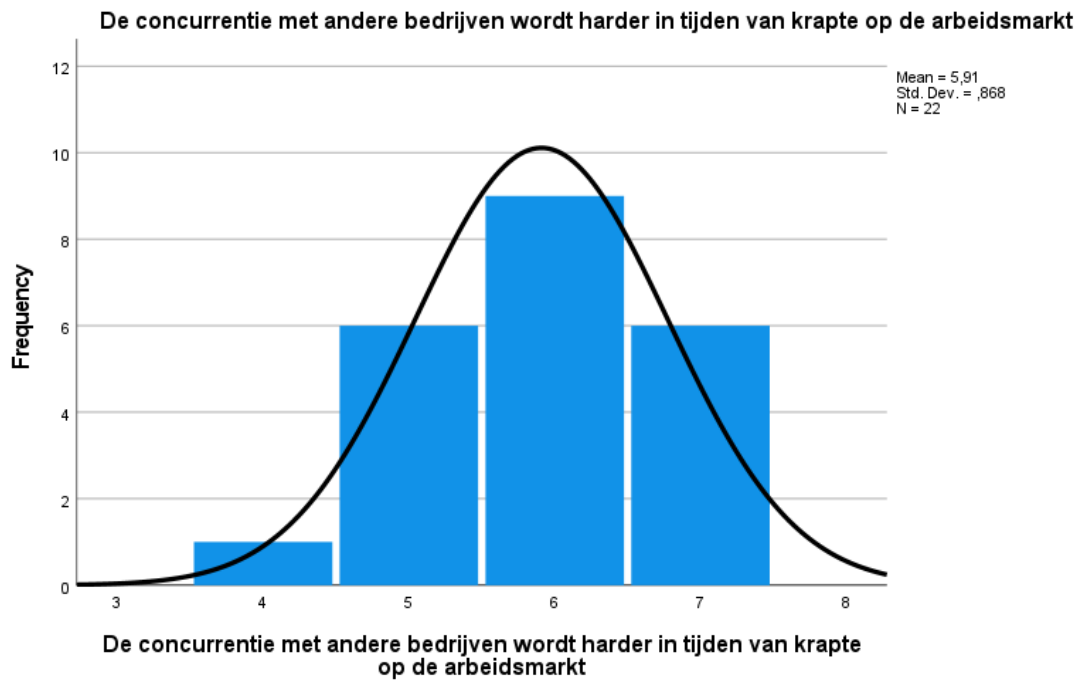
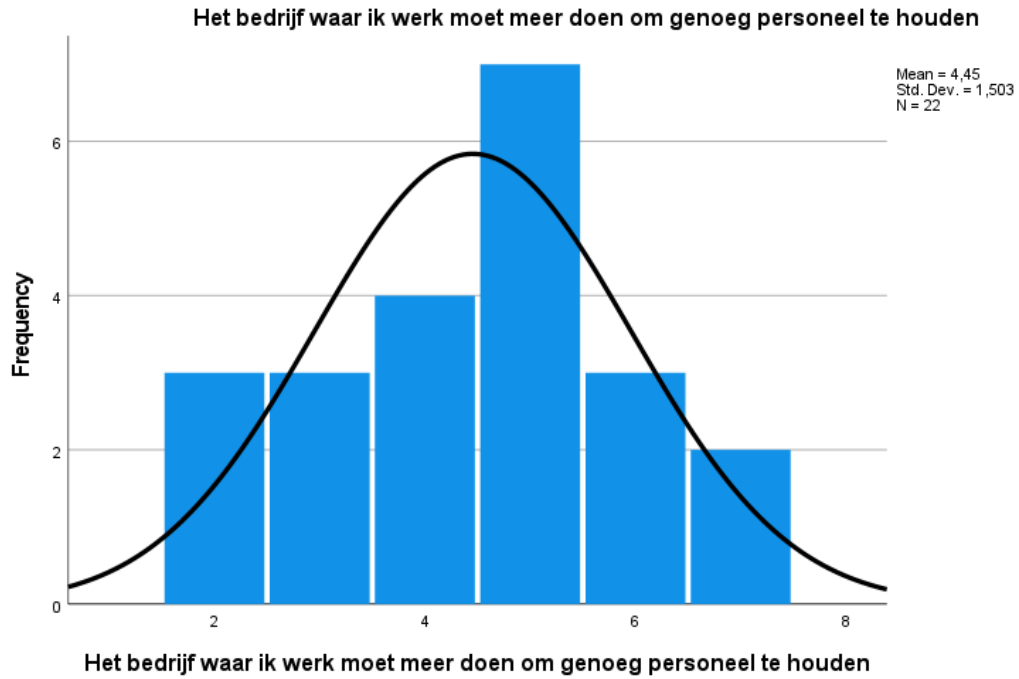


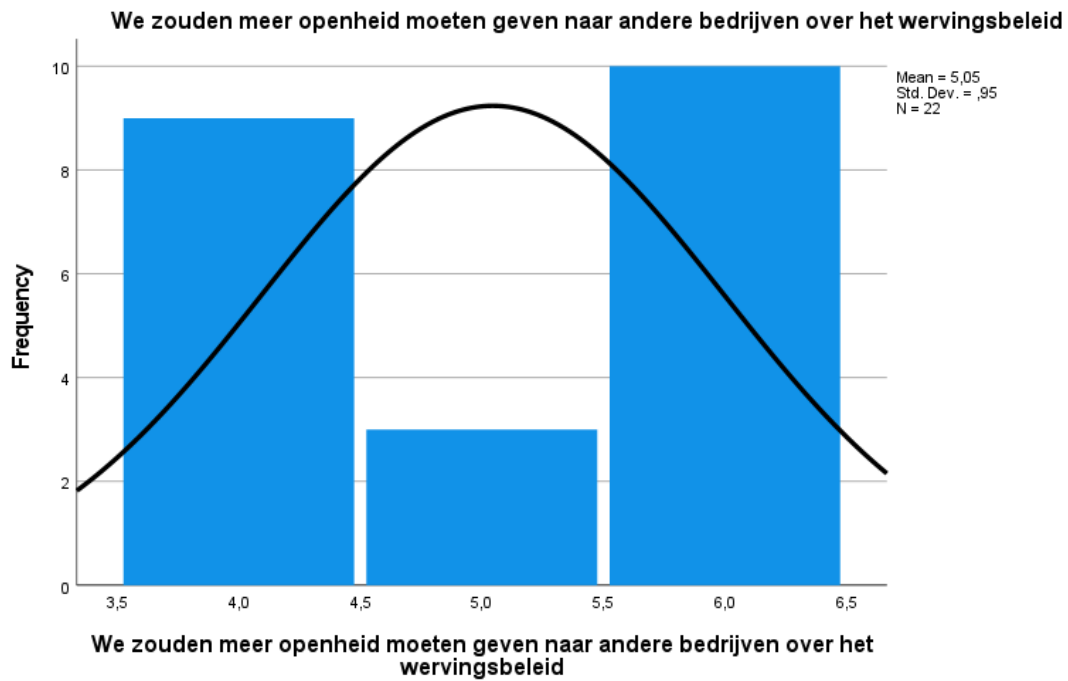
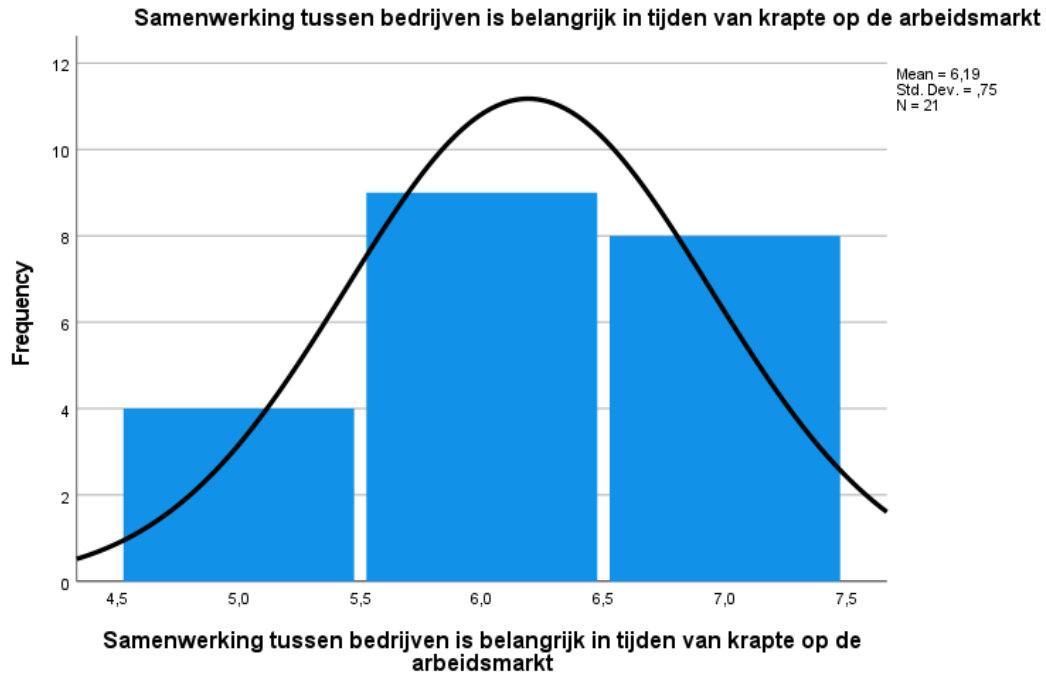
Het bedrijf waar ik werk onderneemt de juiste acties om te kunnen omgaan met de huidige arbeidsmarkt

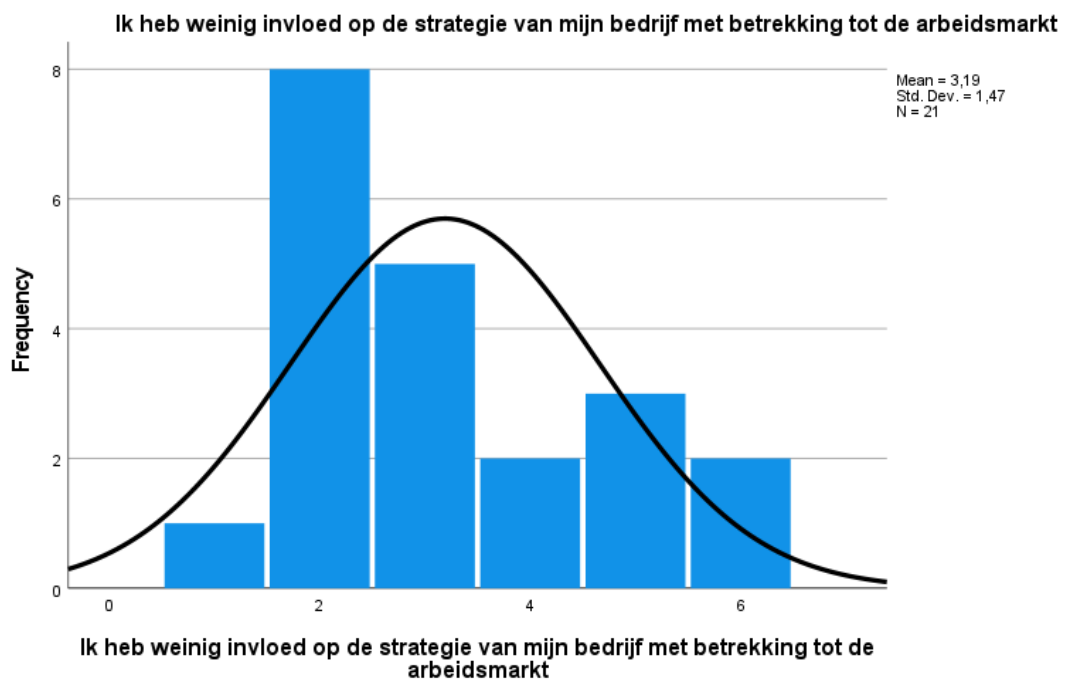
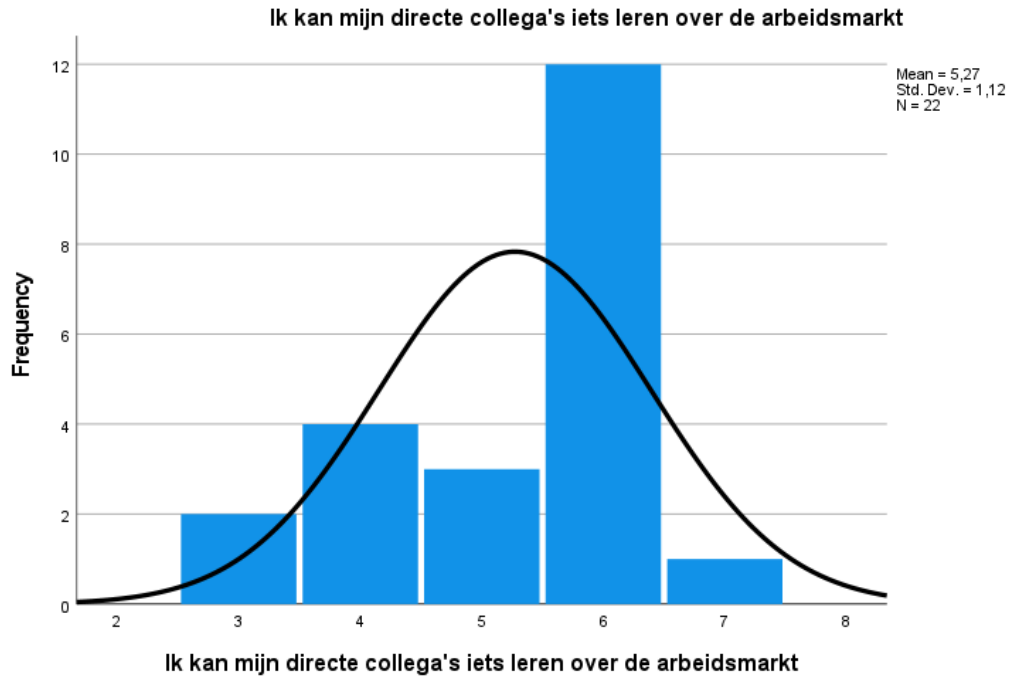


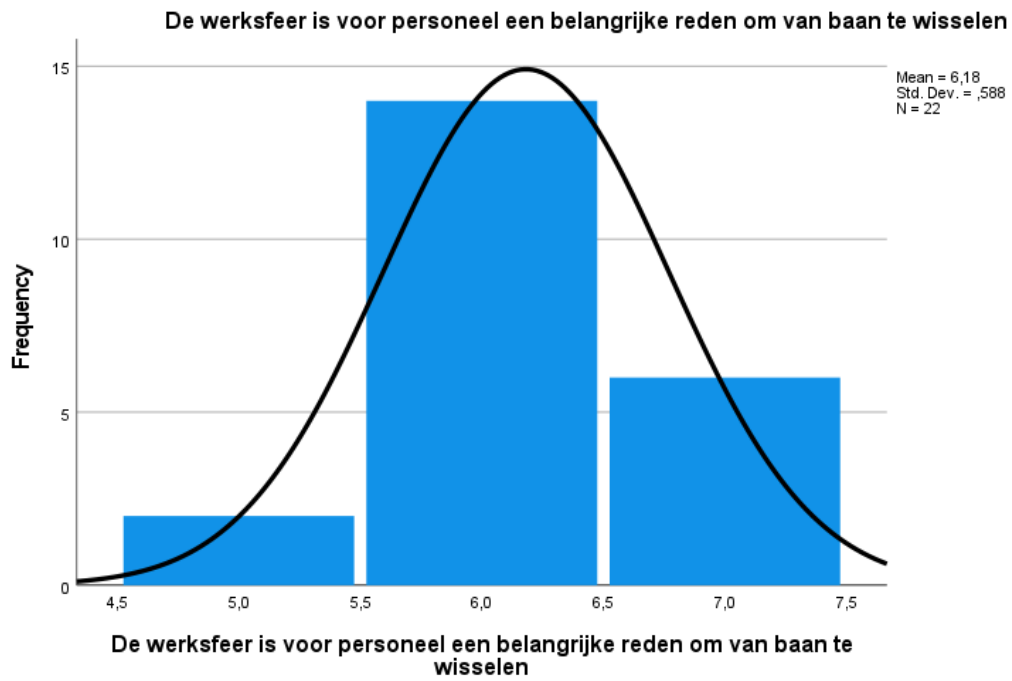
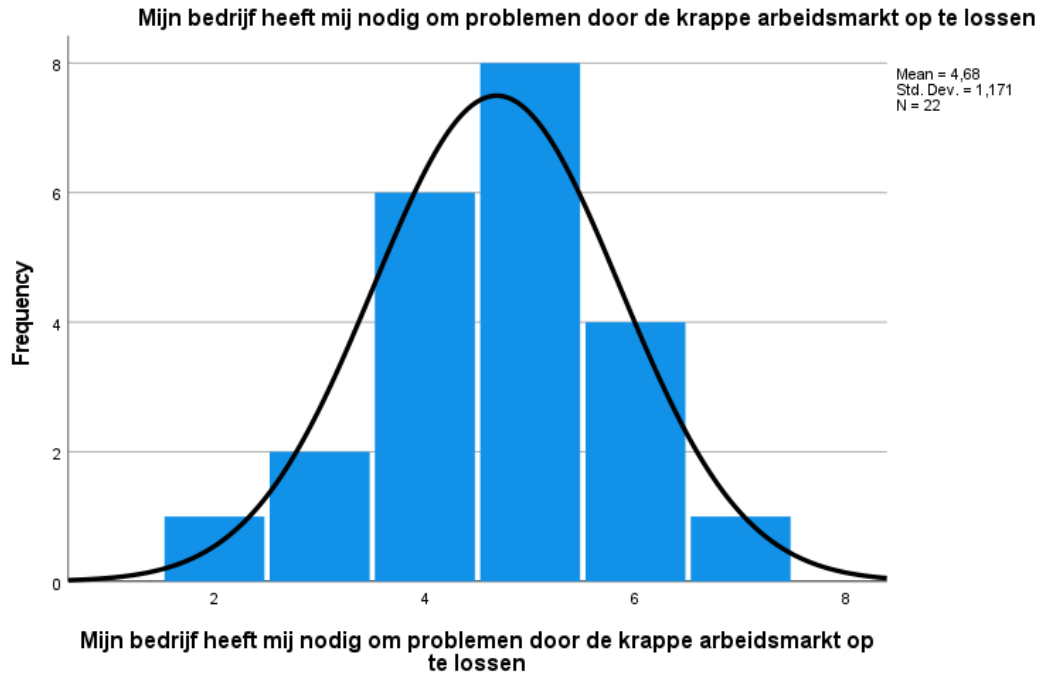
Het bedrijf waar ik werk heeft veel kennis in huis over de arbeidsmarkt

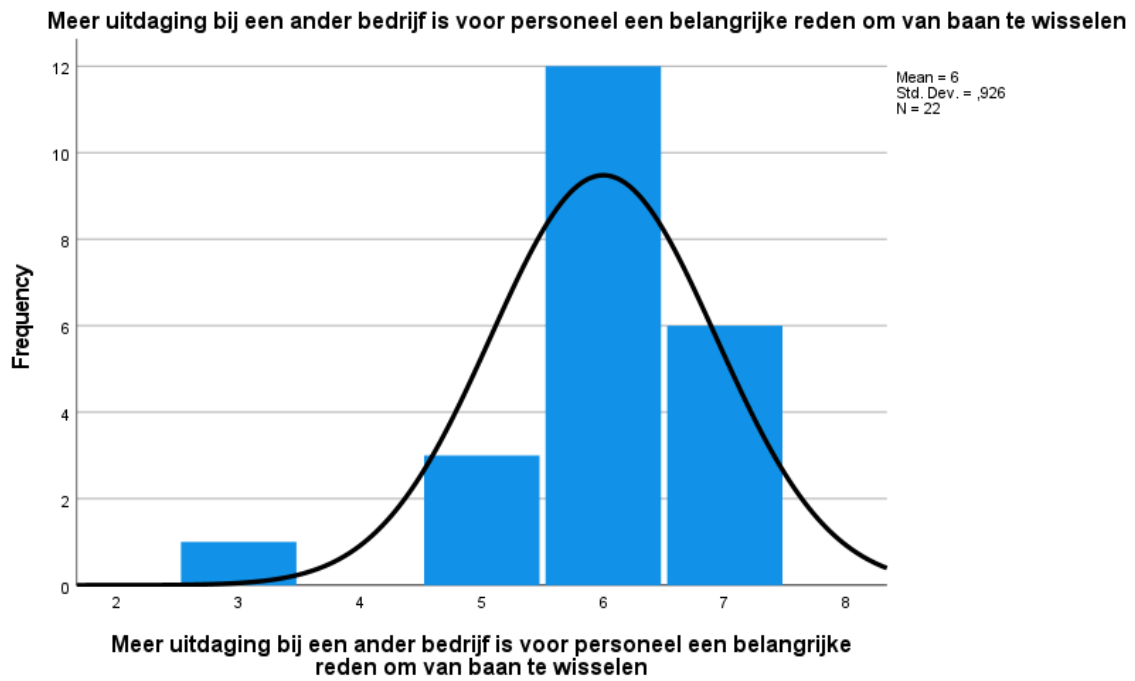
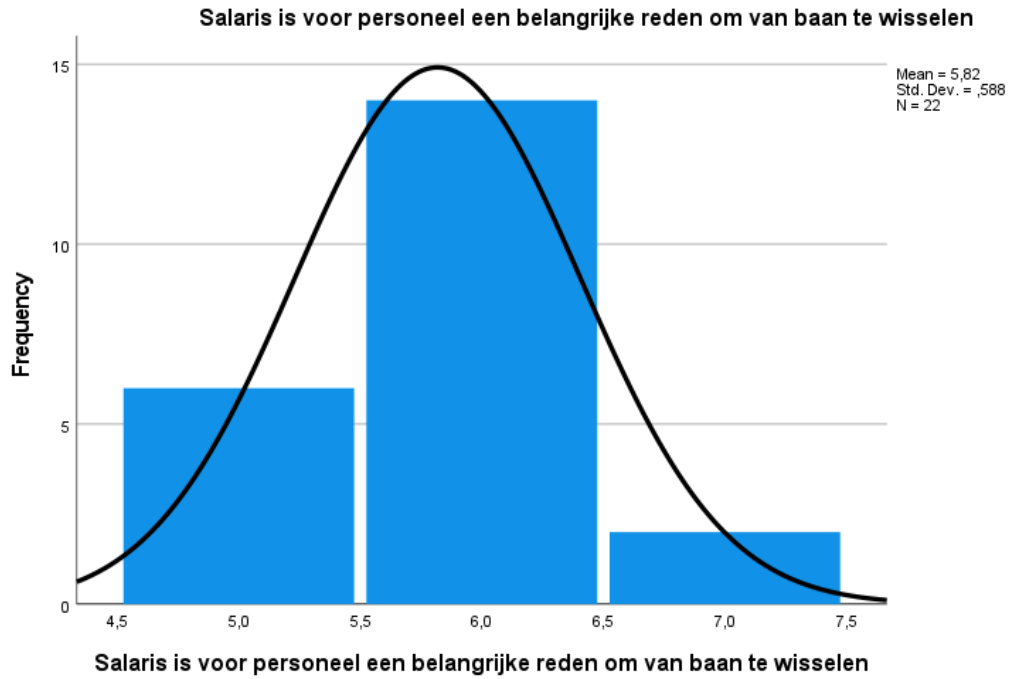




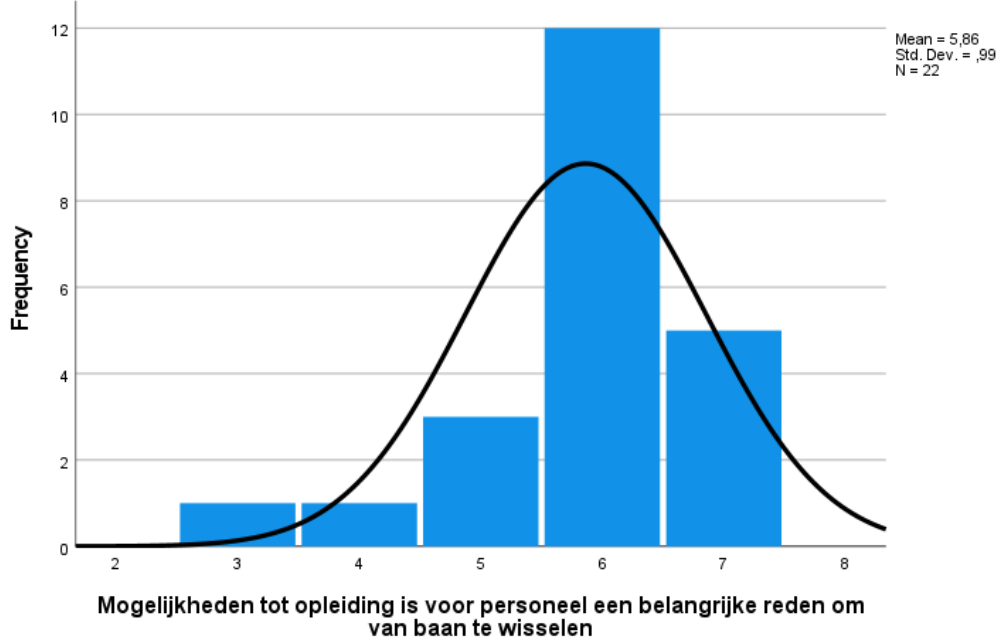




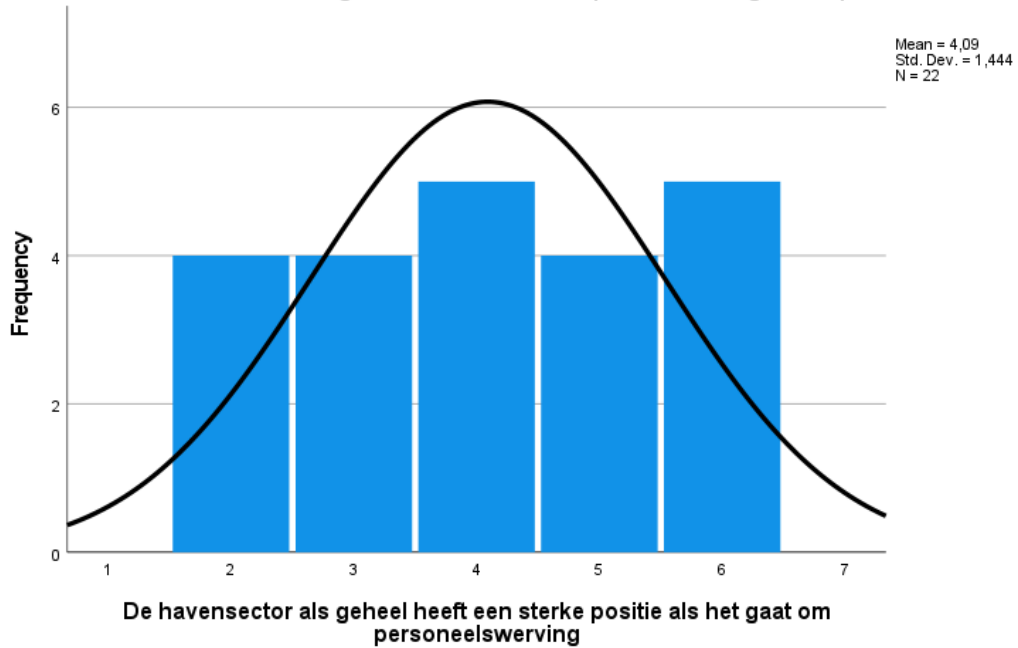


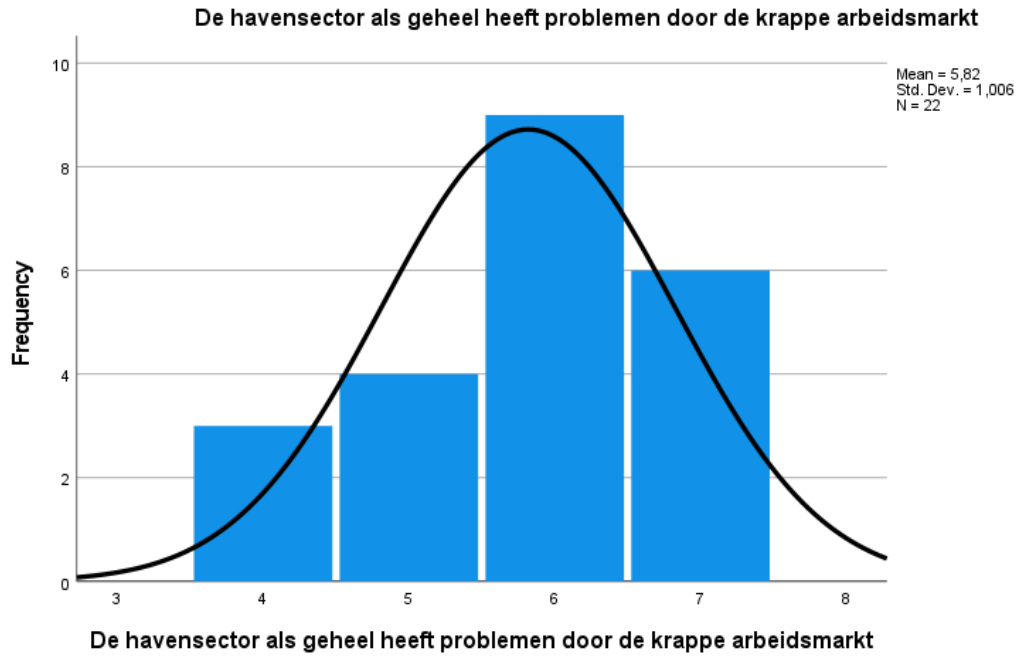


Mogelijkheden tot opleiding is voor personeel een belangrijke reden om van baan te wisselen

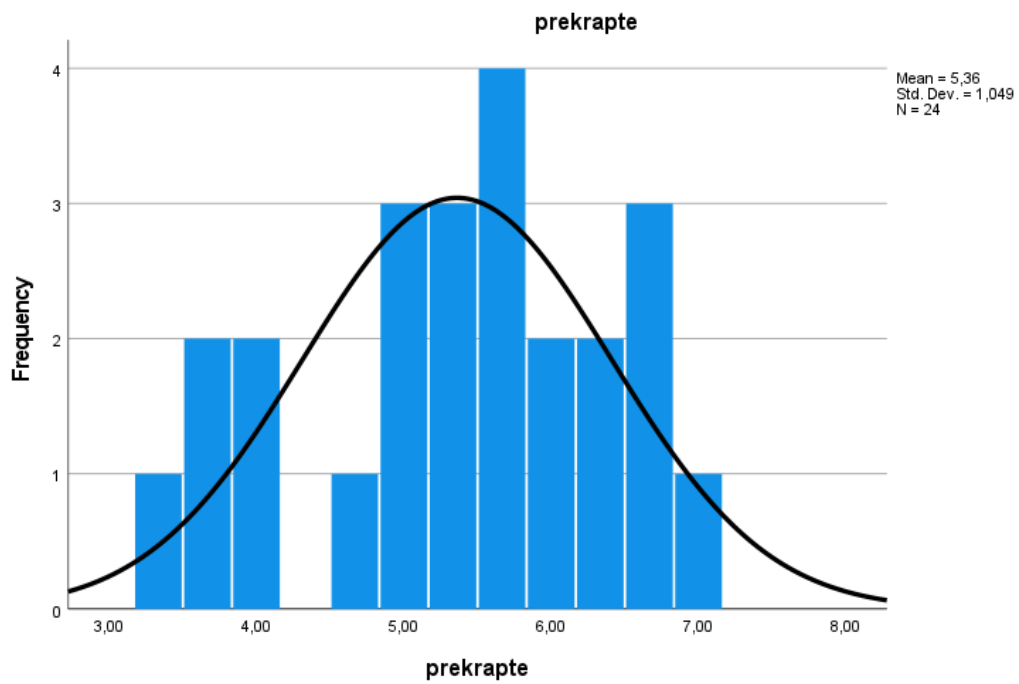


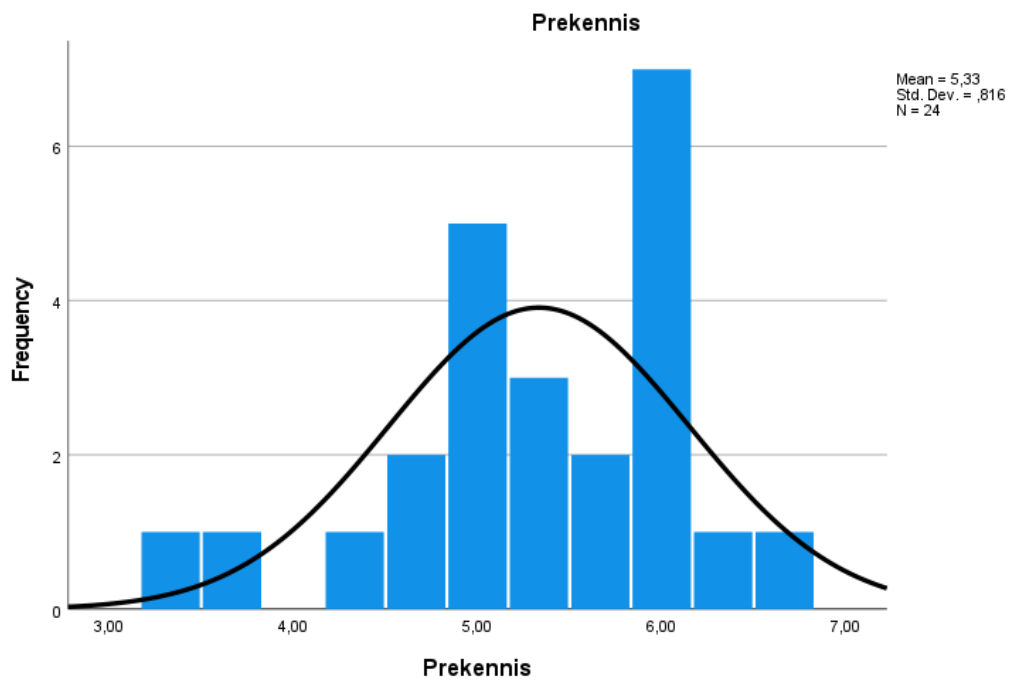
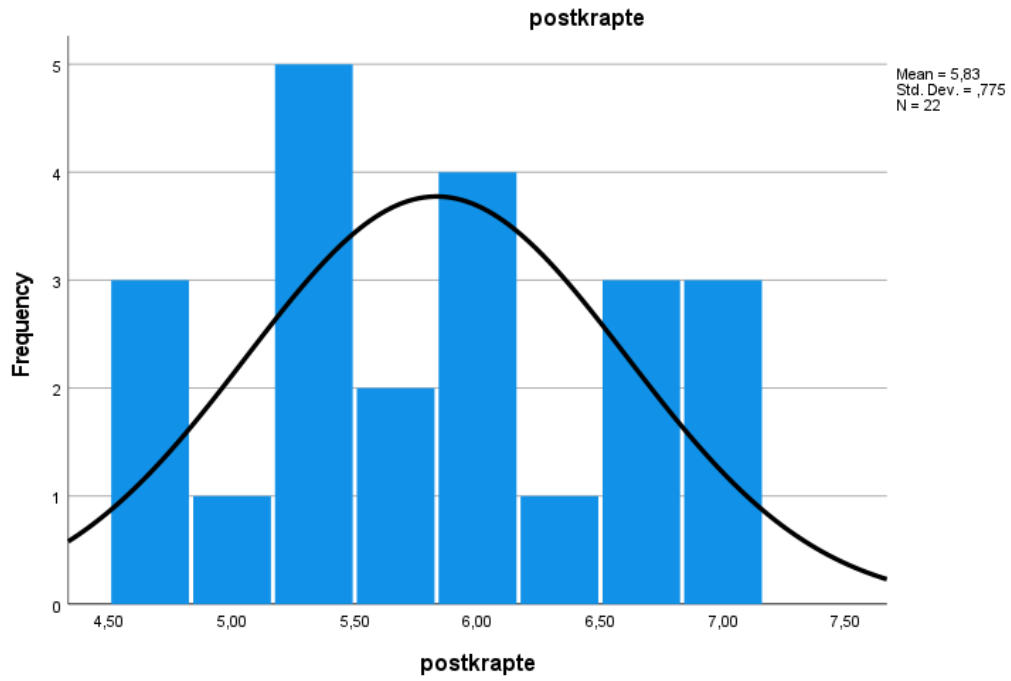
De havensector als geheel heeft een sterke positie als het gaat om personeelswerving

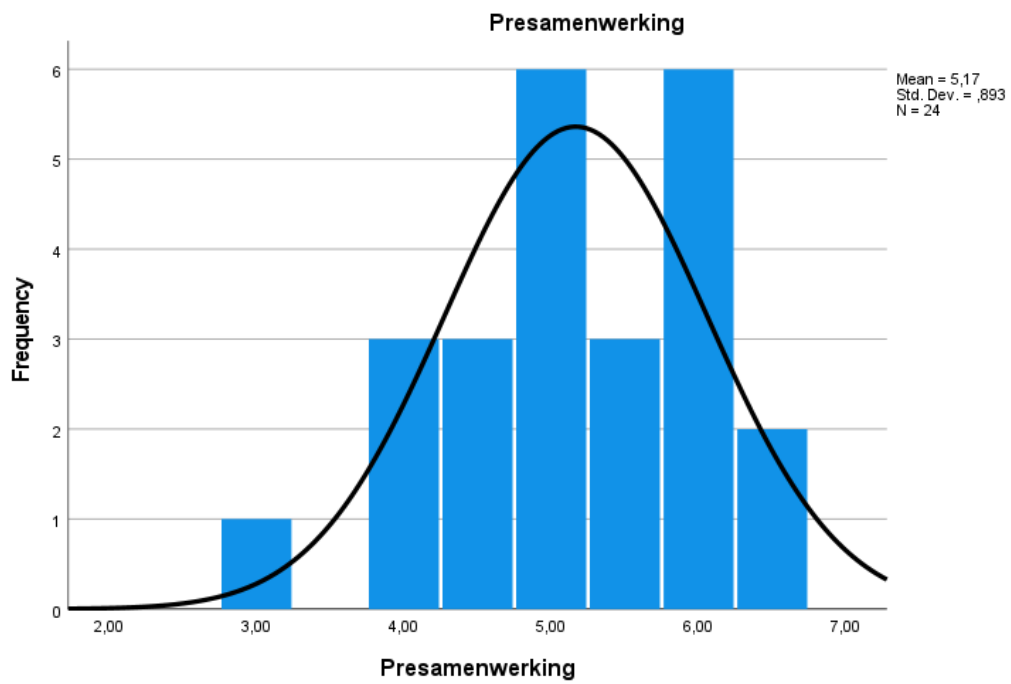
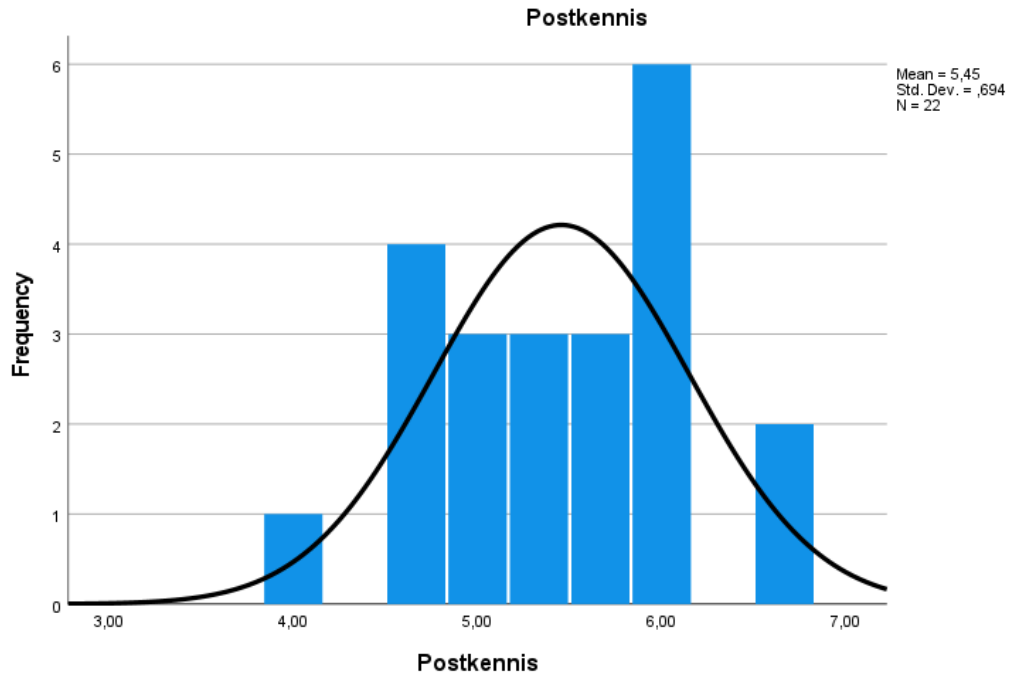


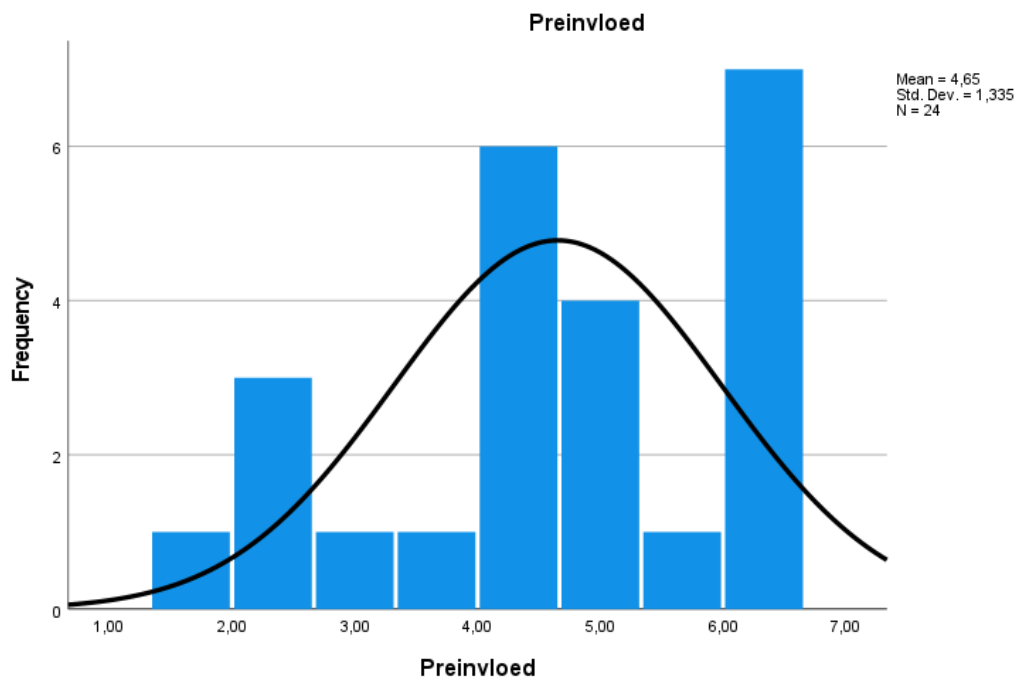
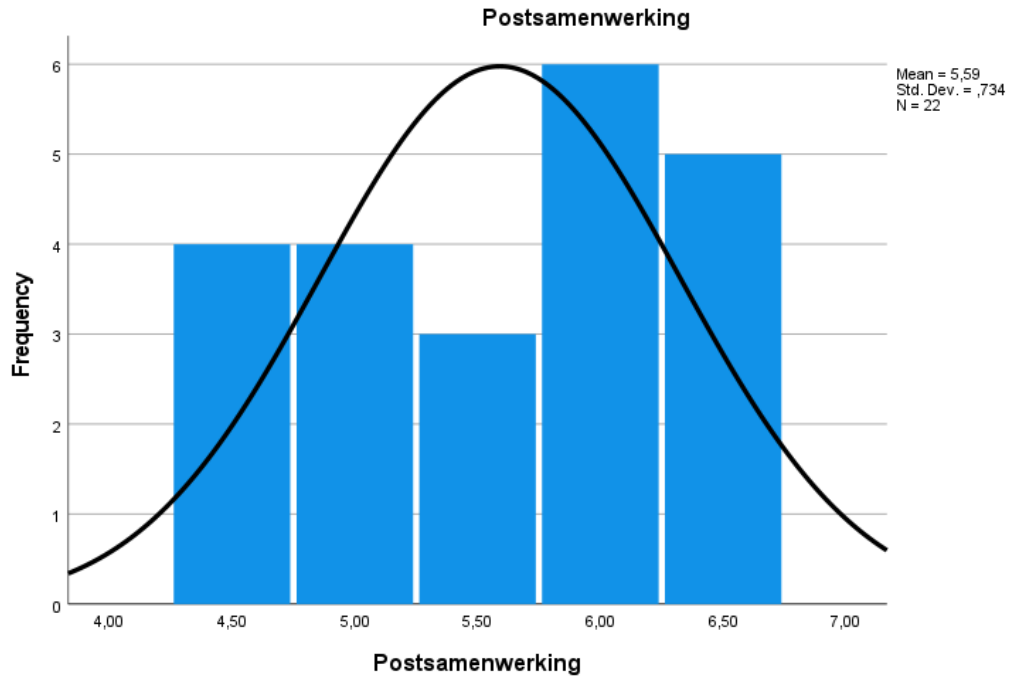


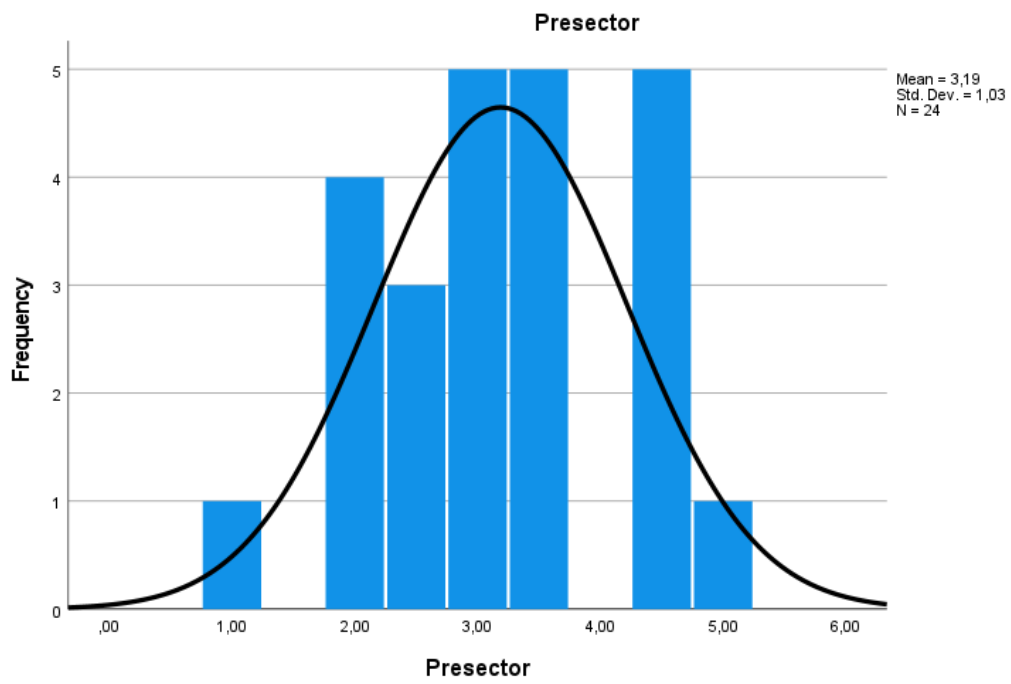
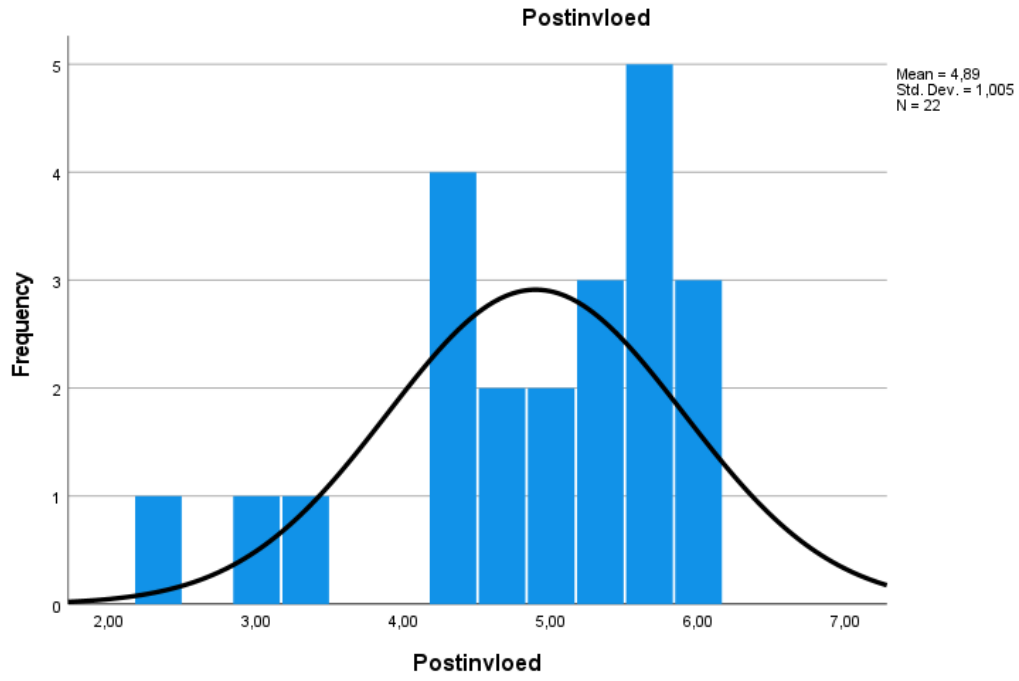
Computed factors

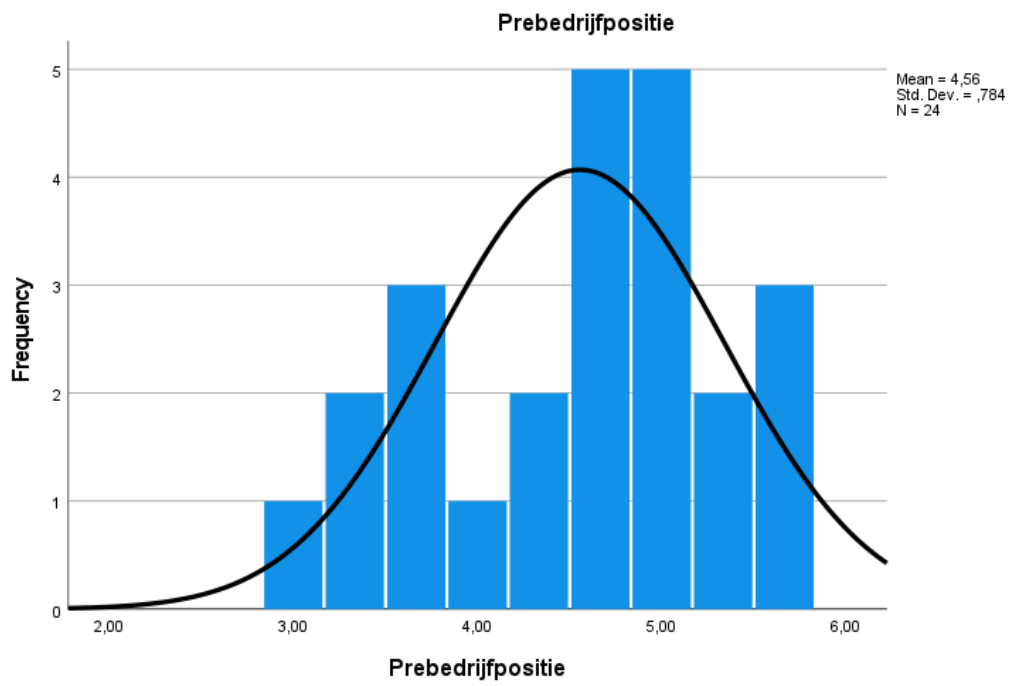
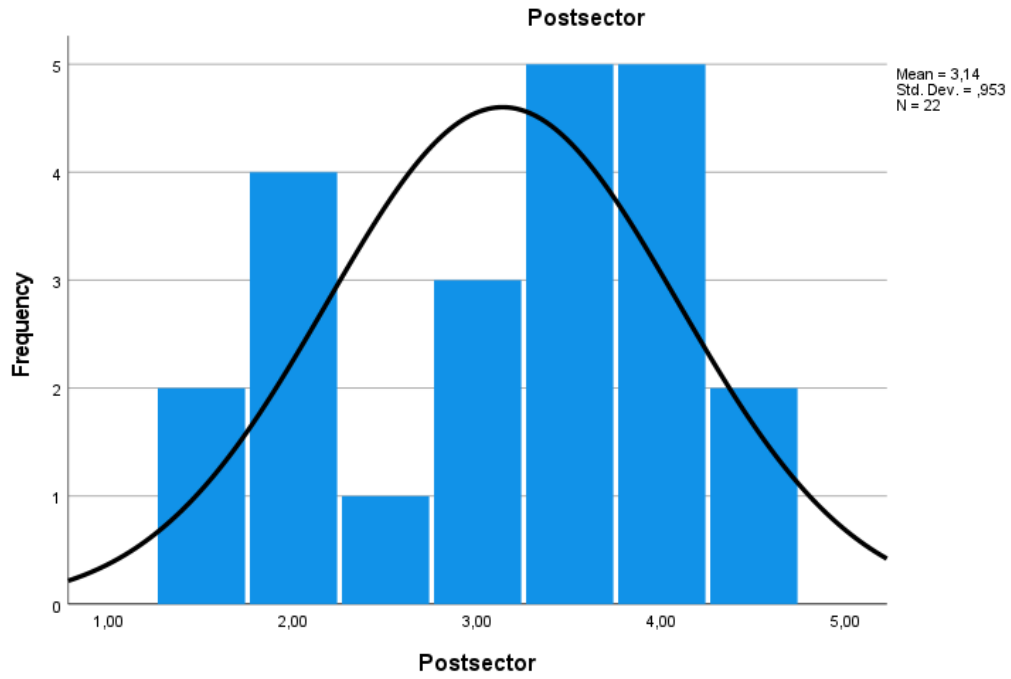


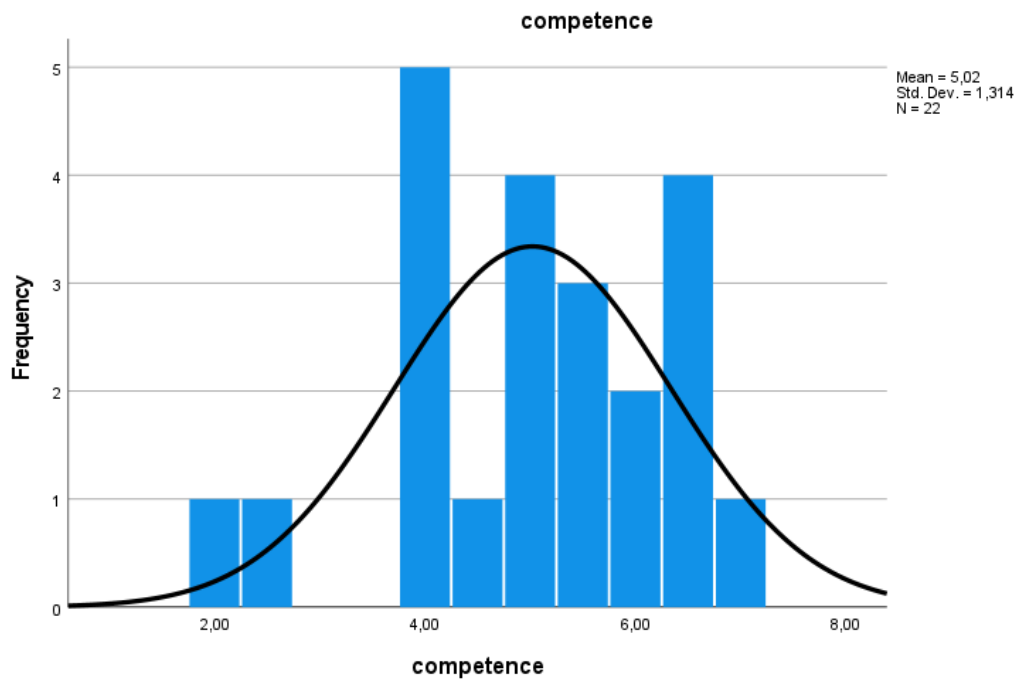
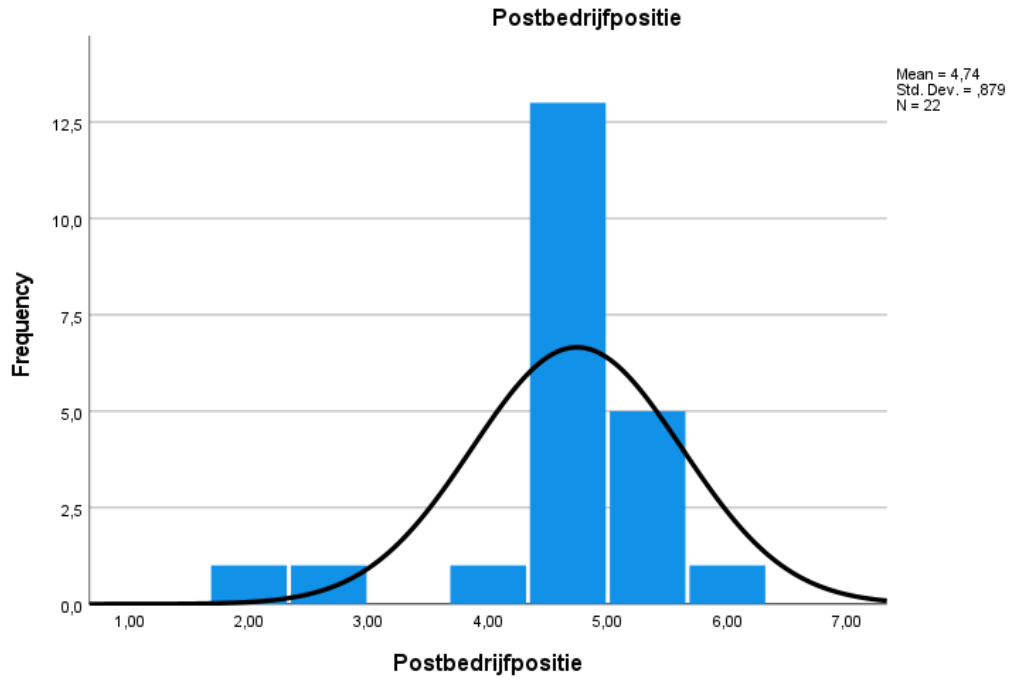


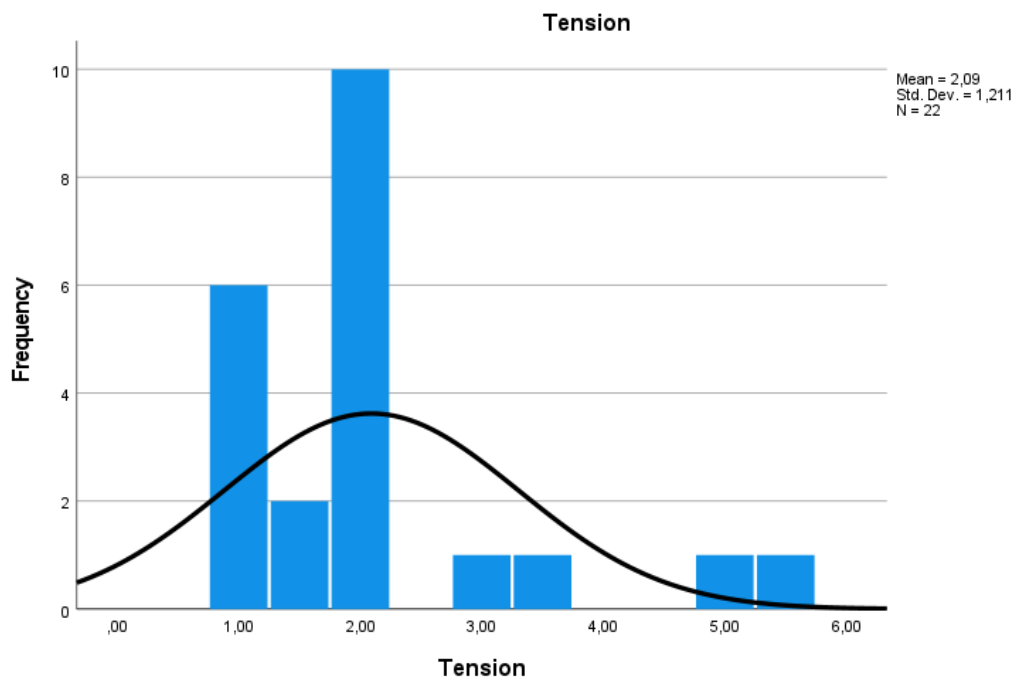
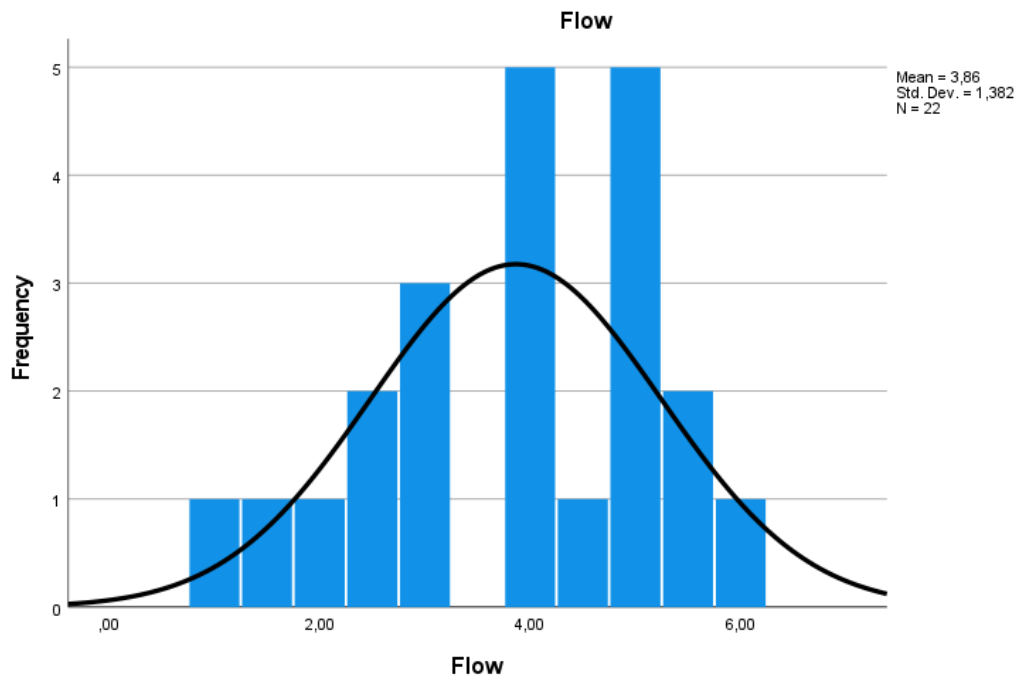


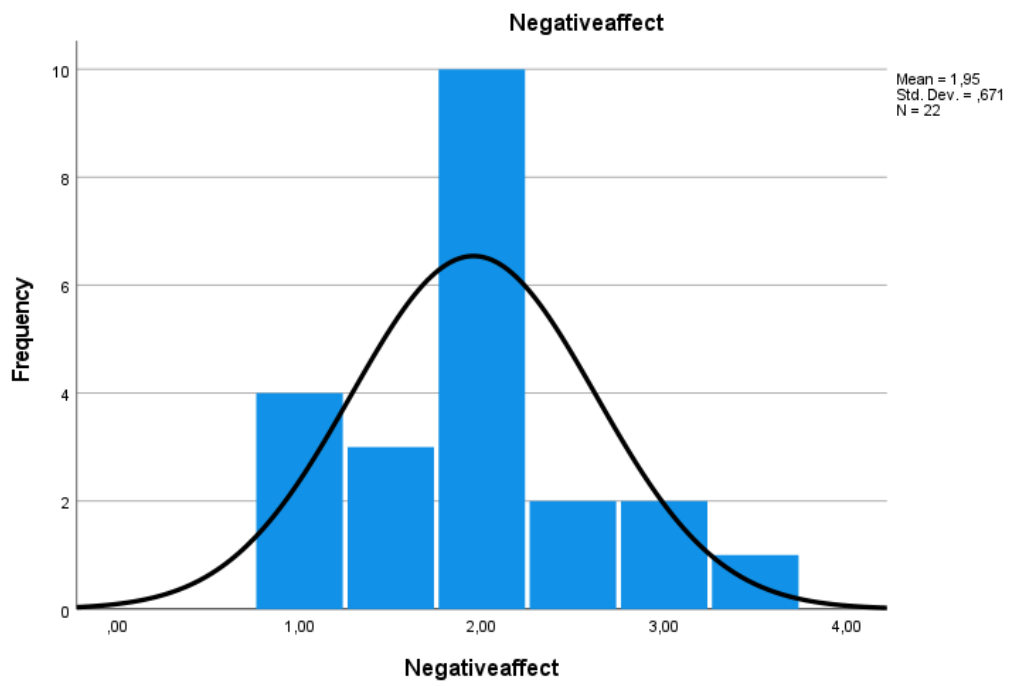
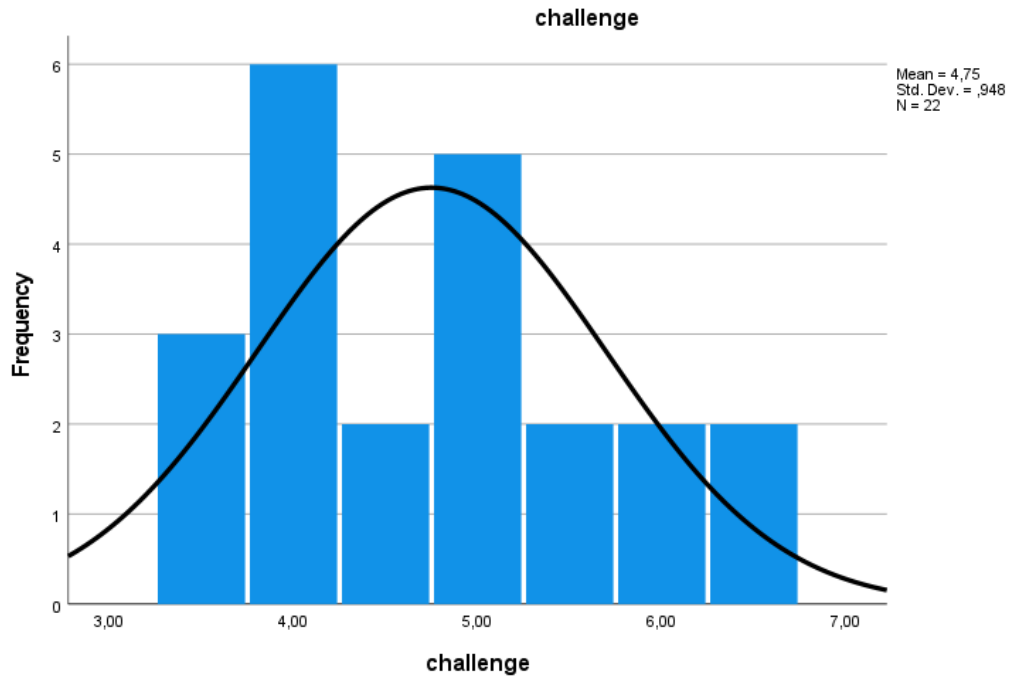


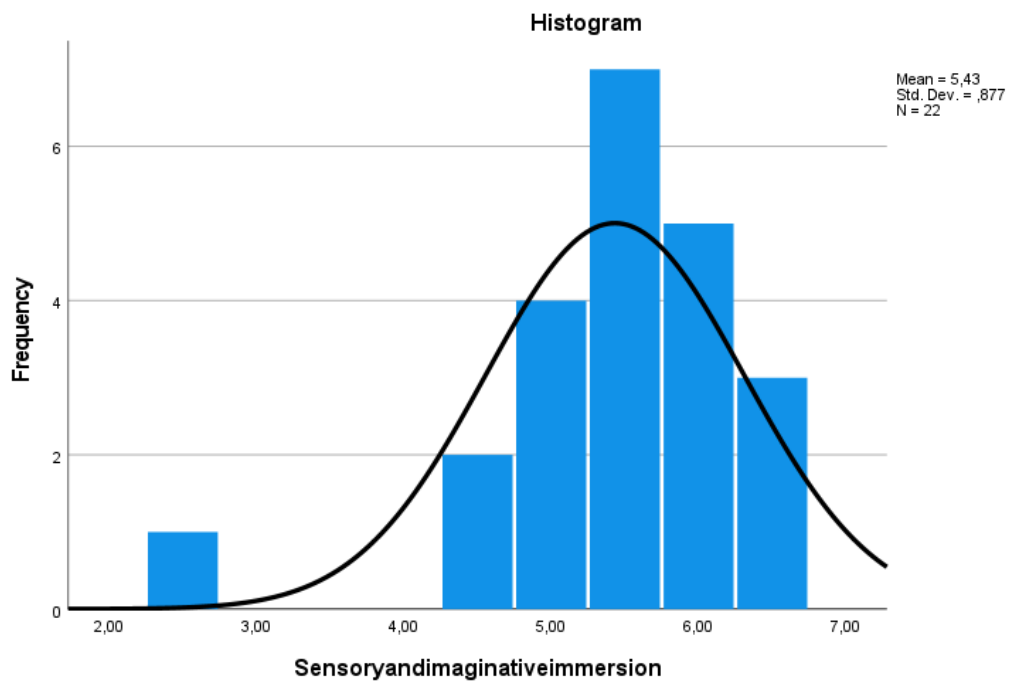
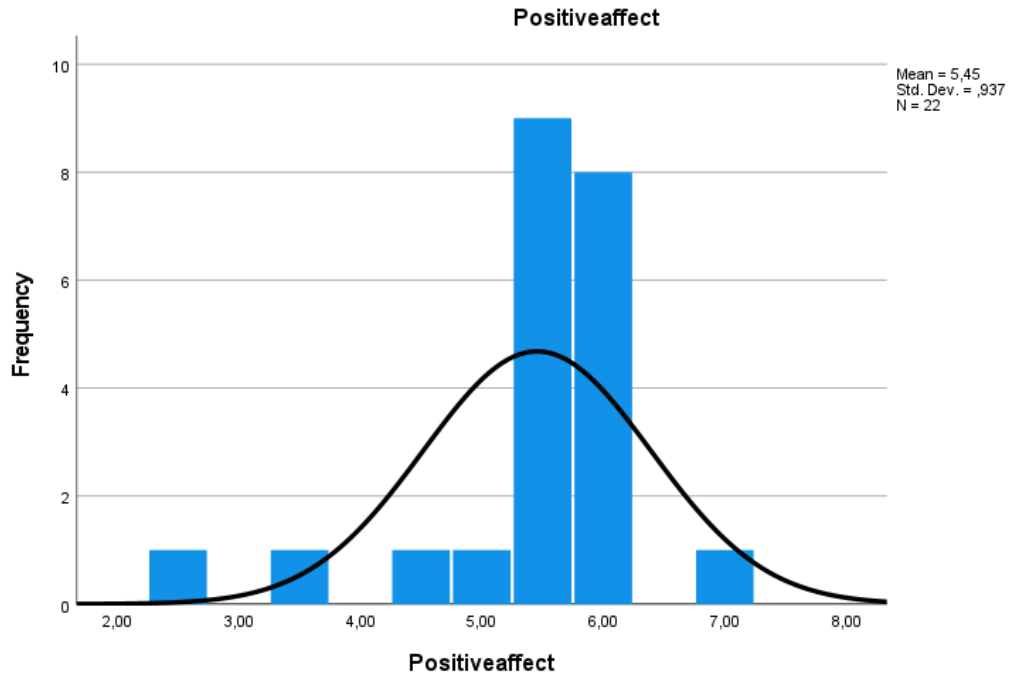












Appendix 11: Comparison pre- and post-survey

Test Statistics^a

	postkrapte - prekrapte	Postkennis - Prekennis	Postsamenwer- king - Presamenwerk- ing	Postinvloed - Preinvloed	Postsector - Presector	Postbedrijfsposi- tie - Prebedrijfsposi- tie
Z	-1,760 ^b	-,887 ^b	-2,246 ^b	-,684 ^b	-,145 ^c	-1,309 ^b
Asymp. Sig. (2-tailed)	,078	,375	,025	,494	,885	,191

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

Test Statistics^a

arbeid 1 Er is krapte op de arbeidsmarkt in de	Het is eenvoudig vacatures in te vullen voor de	De arbeidsmarkt van de havensector zal vanzelf weer ruimer worden - De	Ik ben op de hoogte van problemen op de arbeidsmarkt van de	Ik ben op de hoogte van nieuwe ontwikkelingen op de arbeidsmarkt-	Het bedrijf waar ik werk ondernemt de juiste acties om te kunnen omgaan met de huidige arbeidsmarkt - Het bedrijf waar ik werk	Het bedrijf waar ik werk heeft veel kennis in huis over de arbeidsmarkt -	Het bedrijf waar ik werk moet meer doen om genoeg personeel te houden - Het	De concurrentie met andere bedrijven wordt harder in tijden van krapte op de arbeidsmarkt - De concurrentie
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Test Statistics^a

Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt - Samenwerking tussen bedrijven is belangrijk in tijden van krapte op de arbeidsmarkt	We zouden meer openheid moeten geven naar andere bedrijven over het wervingsbeleid - We zouden meer openheid moeten geven naar andere bedrijven over het wervingsbeleid	Ik kan mijn directe collega's iets leren over de arbeidsmarkt - Ik kan mijn directe collega's iets leren over de arbeidsmarkt	Ik heb weinig inloed op de strategie van mijn bedrijf met betrekking tot de arbeidsmarkt - Ik heb weinig inloed op de strategie van mijn bedrijf met betrekking tot de arbeidsmarkt	Mijn bedrijf heeft mij nodig om problemen door de krapte arbeidsmarkt op te lossen - Mijn bedrijf heeft mij nodig om problemen door de krapte arbeidsmarkt op te lossen	De werksfeer is voor personeel een belangrijke reden om van baan te wisselen - De werksfeer is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	Salaris is voor personeel een belangrijke reden om van baan te wisselen - Salaris is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	Meer uitdaging bij een ander bedrijf is voor personeel een belangrijke reden om van baan te wisselen - Meer uitdaging bij een ander bedrijf is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	Mogelijkheden tot opleiding is voor personeel een belangrijke reden om van baan te wisselen - Mogelijkheden tot opleiding is voor personeel waar een tekort aan is een belangrijke reden om van baan te wisselen	De havensector als geheel heeft een sterke positie als het gaat om personeelwerv- ing - De havensector als geheel heeft een sterke positie als het gaat om personeelwerv- ing	De havensector als geheel heeft problemen door de krapte arbeidsmarkt - De havensector als geheel heeft problemen door de krapte arbeidsmarkt	
Z	-1,890 ^b	-1,805 ^b	-1,800 ^b	-1,098 ^c	-,722 ^a	-2,066 ^b	-1,294 ^b	-1,035 ^b	-1,200 ^b	-,263 ^a	-1,749 ^b
Asymp. Sig. (2-tailed)	,059	,071	,070	,272	,470	,039	,196	,301	,230	,793	,454

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.