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HIGH SCORE:

A qualitative study on how gaming can further awareness in office environments

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Abstract

Gamification as an educational tool has been explored extensively in traditional academic contexts such as universities and schools. There is however a lack of research on the usage of games for educational purposes in organizations, and even less research has evaluated games' potential in creating organizational awareness. To understand if companies could benefit from gamification, this study looked at how employees' professional backgrounds, social interaction and context during a game experience can influence employees' awareness of the organization. In order to do that, a digital game that portrayed the supply chain process of an industrial company and focused on specific key aspects was built and tested with 17 employees in a large international organization. The results show that digital games can further both awareness of the organization by letting employees play and experience key aspects of the delivery process. The most noticeable increase in awareness were with the participants whose work is not directly involved in the supply chain.

Keywords: Games; Gamification; Educational games; Awareness; Supply chain

1. Introduction

Operating within a knowledge-based economy means learning to adapt and innovate by improving existing strategies as well as create and integrate new ones (Kang et al., 2007). For many industries and organizations, knowledge and information have become important assets and are commonly viewed as a commodity (Kauppinen, 2014), and the ability to share knowledge among employees within an organization is vital for gaining a competitive advantage (Wang and Noe, 2010). However, large companies are often working on a global scale which means increased flexibility in working hours and fragmentation of workforces can result in reduced awareness of activities outside of employees' direct vicinity. Moreover, organizational awareness is also highly important for companies to pay attention to, as it contributes to a sense of organizational identity which influences how employees see and make decisions and how they approach challenges (Dutton and Dukerich, 1991). Gaps in awareness on the other hand can result in less sharing of knowledge and collaboration which leads to a declining sense of community (Huang et al., 2002).

When trying to increase awareness, companies have mostly been focused on enhancing accessibility and visibility of information, e.g. in the form of information monitors (Huang et al., 2002) as well as through digital awareness programs (see Sabillon et al., 2019). Existing literature on the area have established technological methods for the spreading of awareness. Studies have also researched how gamification can educate employees working in logistic about specific aspects (Warmelink et al., 2018). However, there are no studies on how gamification could be used for the purpose of increasing organizational awareness among employees. Gamification has proven to be very useful in areas such as learning, skill acquisition, changing behavior and reinforcing knowledge (see Boyle et al., 2011; Wangenheim and Shull, 2009). For gamification strategies to succeed in these areas there needs to be an understanding of the *context* where the strategy is implemented since that can be crucial for the success of gamification initiatives (Ruhi, 2015). It is also important to understand the targeted user since the user experience can be the difference between a successful game and a failed one (Ferrara, 2013). *Social interaction* has proven to be another important aspect to consider when using gamification because of the significant it can have on the user's enjoyment (Scheiner, 2015). This study will also factor in players *professional background* to see how that factors into the enjoyment and increase in awareness. Games as an educational tool is well explored in traditional academic areas, while gamification on the other hand has commonly been explored within organizations. However, there is not much research on the usage of games in organizations for educational purposes, and even less research has explored the potential of games for creating organizational awareness. Furthermore, there is a scarcity of studies in both educational and organizational gamification that explores "deeper" game elements (see Bonde et al., 2014; Hu and Boskic, 2015), such as choice and failure (Dichev and Dicheva, 2017). Organizational awareness can be very broad term and include many factors, this study has focused on awareness of the delivery process. This study will also look at how the game affects participants knowledge about the delivery process as part of measuring awareness.

The study aims to evaluate how a digital game in an office environment can further awareness of an organization from a user perspective. The thesis is specifically guided by the following research questions: how does *social interaction, professional background,* and *context* contribute to increasing awareness? Understanding these aspects will provide a perspective on how to implement as well as use gamification from a user perspective.

1.1. Collaboration with Volvo Trucks

Volvo trucks is one of nine business areas of the Volvo Group, a Swedish manufacturer of trucks, buses, engines and equipment, that employs about 100,000 people and operates in almost 200 markets. One of its three divisions is the "Group Trucks Operations" division. They are concerned with the production of Volvo Group's engines, the production of trucks from the different Volvo brands (e.g. Volvo, Renault or Mack) and are also taking care of logistics and the supplies of spare parts to customers. The latter lays in responsibility of the Service Market Logistics (SML). Within SML the Strategy & Business Office drives strategic change and sets a strategic direction on how services and a focus on customers, can make a difference for people using the products.

Within the Strategy & Business Office it is believed that in order to be successful with a strategy, the whole organization needs to be connected, engaged and committed to it on a day-to-day basis. That's why there is an interest to know if gamification could be used to create a better understanding of strategies, but also connect, engage and secure commitment inside the organization regarding these strategies. Part of the study was therefor to also deliver a concept that could be tested within the organization and understand how gamification can be used for communication.

2. Related research

It is acknowledged that there is a distinction that can be made between gamification and educational gaming. Namely, that gamification concerns game elements such as points and badges, implemented into a non-traditional game environment with the goal of enhancing a process or create value (see Huotari and Hamari, 2012), whereas, an educational game is more similar to an entertainment game with rules and goals but designed to teach about subjects or change players attitude (Peixoto et al., 2011). However, for this thesis, both educational games and gamification are researched. Even though the study uses a game as a prototype, there are multiple aspects taken into consideration in order to understand what does and does not work, which means that there is a torrent of gamification elements influencing this thesis.

The potential of gamification has created a lot of interest from businesses, organizations. It has been seen as a method that can enhance work tasks, boosting user engagement and worker productivity. Gamification within academia has also grown in popularity where a clear increase in published papers on the topic of gamification can be seen over the last decade (Hamari et al., 2014).

Gaming is often for entertainment purposes, but the same functions of working with a set number of rules towards a goal can also be relevant in educational or work environments as well. The game experience is supposed to increase motivation, hence increasing productivity and learning through heightened engagement. A popular example is Fitocracy (Hamari and Koivisto, 2015) which uses badges, and points to keep its users engaged.

2.1. Games and gamification in office environments

Research in organizations and office environments usually explore the concept of gamification by testing different game mechanics to see the effect it can have on motivation. A majority of studies report positive results (see Hamari et al., 2014) which usually means an increase in productivity or changed behavior (Farzan et al., 2008) amongst employees, which is why organizations have shown an interest in the method. However, to accomplish an increased productivity or similar results there needs to be an understanding in which game mechanics

to use. Some game mechanics have the potential to satisfy basic psychological needs (Perryer et al., 2016) and create an intrinsic motivation where goals feel autonomous rather than controlled (Deci and Ryan, 2000). The user's motivation arises from within where the goal feels personally rewarding e.g. learn about new things. Furthermore, games have the potential to be used in other areas than motivation. Reinecke (2009) concluded that games can become a great way for employees to recover from demanding mental tasks which indicates that there are other areas than knowledge acquisition. Evidence also show that games can influence behavioral change, support collaborative interactions and empathy (Boyle et al., 2016) which makes it relevant because understanding others perspective can help increase awareness.

Multiple motivational affordances in gamification have been empirically researched. The most common variants are *points*, *badges* and *leaderboards* (Hamari et al., 2014; Ruhi, 2015) which is, most likely, because those mechanics are easy to implement and measurable in an office. Also, many companies have gamified large parts of their products and services e.g. *Duolingo* which uses badges, level ups and points in order to motivate the user to learn. Other examples of game mechanics are: *social aspects*, *stories*, *choice*, *low risk failure*, *narratives*, and *role-play* (Dichev and Dicheva, 2017; Scheiner, 2015). Badges and points in themselves are not enough of a reward. These must also symbolize an actual achievement (Perryer et al., 2016). Monetary rewards play a minor part in attracting participants, especially if there is repeated participation. Storytelling has been concluded to motivate players, however it is very contextual, where the wrong setting can generate a tedious and time-consuming experience (Scheiner, 2015).

This study will explore social aspect as one out of three main focuses because of its impact it can have on the user experience. Scheiner (2015) found that social aspect of games can be a strong motivator that can be implemented in multiple ways, but generally, social games tend to be better received than single player experiences (Hamari and Koivisto, 2015; Scheiner, 2015). Social factors can also become a motivator because it can give a context where players are able to compare themselves to others (Ruhi, 2015). Competition that is team-based and localized against other teams can unite players against a common opponent and are likely to generate social connection as well as healthy cooperation (Perryer et al., 2016). However, Farzan et. al. (2008) found that games and gamification promoting collaboration can be more enjoyable than those which emphasizes competition. Hence making it important for this study to consider the competitive aspect since part of the study is to understand the context and social aspects.

However, arguably the most important aspect for successful gamification in offices is how it is implemented. The reason for this is that games are supposed to be fun which means that forcing employees to play can thus become *mandatory fun* (see Mollick and Rothbard, 2014). Ruhi (2015) concluded that, in order to be effective, gamification initiatives need to be incorporated within existing workflows and systems. Hamari et. al. (2014) made similar findings which emphasize the importance of implementing games in the right context and for a carefully considered target group. This is particularly important for larger companies such as Volvo Group where a large number of departments with different perspectives and one gamification method will not necessarily be suitable for all.

A majority of studies on gamification have shown positive results where they managed to increasing productivity and/or making current tasks more enjoyable. This indicates that games and gamification can be a method used to increasing motivation and changing behavior. However, it is not a guaranteed method for success. Games can differ greatly from each other, and the same is true for the preferences of people playing games (see Farzan et al., 2008) thus making it important to understand context and target group before implementation. The

success of gamification, or the use of games, depend largely on the context where the application is implemented and whom the intended user is (Hamari et al., 2014). Should the implementation and design of gamification be forced on workers by management without their consent and involvement, studies have shown that job performances go down (Perryer et al., 2016). Thus, understanding how to use it before starting to implement gaming strategies is crucial. The usefulness of gamification also depends on users' current state of motivation. Should it be high already, introducing gaming elements will not have a big impact, if any at all. A process or activity that is depending on speed and directness, could even be worsened by gamification (Hyrynsalmi et al., 2017).

2.2. Educational games and gamification

Games and interactive learning have for a long time been seen as an important aspect in education (Winn, 2002). Lately, educational games have become more popular and are seen by many as an innovative strategy to produce more effective ways of learning (Calderón and Ruiz, 2015), and has proven to have a long-term potential (Hamari et al., 2014). Another area is skill improvement or training using games to teach about managerial areas (see Kretschmann, 2012). An example is a police academy that experimented with simulations in order to enhance situational awareness (see Saus et al., 2006). Simulation games have also proven to be able to increase empathy and interest in other cultures (Bachen et al., 2012) which is relevant for spreading awareness since empathy can be part of the understanding of other perspectives. Educational games have also proven to be effective in reinforcing knowledge (Wangenheim and Shull, 2009). Part of the reason for this is the way games provide a safe environment for players to learn, make mistakes and reflect on their actions (Pfahl et al., 2001). Educational games are expected to contribute to a deeper and more active learning where the players are educated from their experiences (Petri and Gresse von Wangenheim, 2017). Hence, the importance of exploring how games can be used as a tool to spread awareness by allowing employees to experience different part of the organization, thus getting a sense of how it works and get educated through their experience.

The design of educational games focuses on teaching, learning skills, changing attitudes and reinforce development (Peixoto et al., 2011). In relation to this, it is important to make the game fun for not only to make it an enjoyable experience, but also because fun can be an important element that influences the amount of learning (Fu et al., 2009). An important design aspect to consider when the target is to enhance learning is to provide the user with direct feedback when they are making a choice. This will make them reflect, thus developing their fundamental understanding (Bonde et al., 2014). Additionally, it is equally important to make some time after playing that is dedicated to debriefing and discussion and explanations of the experience. Furthermore, educational games that are long or very complex has resulted in players losing interest (Wangenheim and Shull, 2009).

The results of educational gamification are mainly positive but has a few drawbacks such as increased competition, task evaluation difficulties and design features (Hamari et al., 2014). Conflicting results was found by Hanus and Fox (2015) where they noticed a reduction in satisfaction from students, compared to the non-gamified class, when they included leaderboards and badges in the gamified curriculum. The noticeable conflict is between the usefulness gamification can have on the development of certain skills and the negative effects some of the elements can have. The problem occurs when the intrinsic motivation clash with extrinsic motivators, which is external rewards such as money and grades. This clash that interfere with the desired outcome occurs when external motivators disrupts intrinsic

motivation and results in users feeling controlled by these external motivators (Deci and Ryan, 2000).

There has also been some critique raised towards educational research where motivation often is the targeted element. However, the measured data is the students study results which means that there is an assumption that increased study results and motivation is synonymous with each other (Dichev and Dicheva, 2017). However, that has not been proven to have a direct correlation which makes it more difficult to rely on these types of studies.

2.3. Organizational awareness

Organizational awareness (Kim et al., 2019) is an important element that binds the organization together and forms a sense of unification that contributes to a sense of meaning (Dibrell et al., 2015). Organizational identity influences how we view and make decisions as well as how we interpret key issues (Dutton and Dukerich, 1991). Additionally organizational identity represents how members view the organization (Ashforth and Mael, 1989) which is important to understand because organizational awareness and organizational identity plays an important role in the success of companies (Barney et al., 1998). Salancik and Meindl (1984) also noted that a strong identification with the organization can increase the engagement from employees. Furthermore, organizational awareness is seen as a critical factor in knowledge sharing and collaboration, particularly between workers that are distributed geographically (Kim et al., 2019) which is the case for Volvo Group that operates on multiple continents. The challenge is to create and maintain a shared understanding of culture and goals when employees are distributed both culturally and functionally (Gibbs et al., 2017). Creating a more meaningful workplace can be part of the solution by enriching the social context within the organization (Pratt and Ashforth, 2003).

There have been efforts to develop ways in which organizations can improve organizational awareness. When successful, enhanced organizational awareness could enable workers to have a more unified workflow which will support collaborative work (Carroll et al., 2003). Huang et. al., (2002) tested information displays for the purpose of promoting stronger awareness of workplace activities that showed information of multiple workstations which resulted in positive feedback where employees described how they had gained insight into projects that they would not otherwise know about. Dabbish and Kraut (2003) had a similar approach about spreading awareness by installing monitors. However, their research focused on whether it could improve communication which had some success in that they improved how people asked for help by creating more insight into departmental work and current workload. Gutwin and Greenberg (1999) reached similar conclusions where participants were able to use more effective strategies by using groupware interfaces. Digital systems have also included shared spaces such as task notifications and task management, thus enhancing collaboration and planning (Carroll et al., 2003). More recent studies mirror these results where digital programs have proven successful in creating awareness among staff (Sabillon et al., 2019).

3. Development of the game

The study started with an introduction week that involved meetings, presentations and interviews which allowed for a better understanding of organizational goals, culture, workflows and the workflow between departments. This introduction consisted of twelve meetings and presentations, with detailed explanations of the different processes, strategies

and reports. Additional interviews were conducted to further understand information that had been presented. The other part of the introductory week was to establish an initial concept. The project started fairly open which meant a lot of freedom when it came to exploring ideas, concepts and a possible context of implementation, with Volvo only serving in the role of advisors.

3.1. Game design

The final concept was designed around the gameplay mechanic of choice where the players play as the entire organization with every organizational tool available. The game was a simulation of the delivery process within the company which means that it was crucial to accurately represent real aspects in the game as well as portray existing ongoing practices (Salen and Zimmerman, 2004). Simulations provide virtual activities that reflects the real world and has been proven to support learning (Boyle et al., 2016). The reason was based on how many options there are to solve back orders in the delivery process. Furthermore, designing the gameplay around making choices allowed the study to further explore the social aspect by having participants playing together and explore decisions in a collaborative way. The large number of choices was also a good representation of what the daily process looks like for many departments. Portraying a simplified, but realistic picture of the delivery process was necessary in order to test other key elements which were to communicate the importance of: ETA (Estimated Time of Arrival); customer focus; urgency; and balance between cost and customer happiness. These four key elements were agreed upon together with Volvo and based on what they deemed important aspects to spread awareness among employees. The reasoning behind building the game on having players making choices were also to allow them to make errors and reflect on why some choices were good and bad. Giving participants the risk of error was also seen as an opportunity for the study to compare and see how employees with different professional background approach and reflected on their choices.

Other game mechanics used were points, storytelling and score board. To understand how gaming can further awareness of the organization it was important to understand these aspects because both points and score boards are often seen as competitive elements which would motivate players to want to do better next time playing (Hamari et al., 2014). Understanding how they are perceived by employees can be important for how gaming is implemented and how information is communicated. Storytelling was added through description of the cases where players were presented with information about the problem, where it had happened, as well as additional context such as an airport strike which influenced the optimal solution for each case. The reasoning behind it was to have players picture the situation and gain a deeper understanding of how that effected their understanding of the process.

Designing the complexity of the game had to be carefully considered because of the participants diverse professional background and knowledge. A lower and more general complexity was used to make it suitable for both players of both little and extensive knowledge. The goal was to make it easy to learn but hard to master. Part of this was to only display the name of the solution without any indication of their values to create an element of uncertainty which is a key component in meaningful play (see Salen and Zimmerman, 2004). Same goes for the cases that presented different situations making the players adapt. Furthermore, there was a minor mechanic that allowed players to make errors where some options would not work in some cases. This was implemented to make sure that players can't fall into repetitive patterns and rely on a few solutions, but also to have players reflect on why some solutions does not work. The final scores and statistics should then also help to understand what

mistakes have been made as well as add a competitive element where players could compare their score with others.

To accomplish an accuracy of viable cases, experts within the company was consulted. The prototype was built in android studio for a Samsung Galaxy Tab 3. Creating it with Android not only made it possible for players to interact through touch gestures but also allows the game to being shared easily within the company later on.

3.2. Gameplay

During the game, the player is presented with 15 cases or scenarios that represent spare part orders. This way the players are presented with choice as a game mechanic and is confronted with risk and failure (see Dichev and Dicheva, 2017; Scheiner, 2015). The task is to pick one out of 12 solutions that are organized into six groups of two and apply this solution to the case. This is done by tapping on one of the categories and then dragging the round icon of one of the solutions into the yellow and black drop zone at the bottom of the case. A case description gives insights and further context on the problem and helps the player with the decision making. These cases are also a story telling mechanic to engage the player (see Scheiner, 2015). Additionally, each case is equipped with a timer of 24 seconds that influences the score of the player (Figure 1).

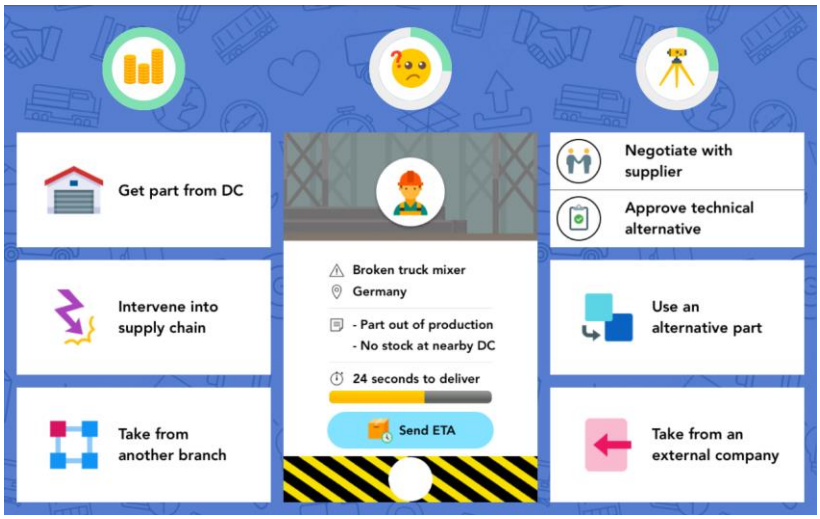

Figure 1: Screenshot of prototype - main screen

Once a solution is applied, the game either shows a message that the solution is not available for this particular case and the player needs to try again, if successful, feedback is given to the user on the quality of the decision. This comes in form of points the user gets in the three parameters: cost, customer happiness and delivery precision. The faster the player makes a decision, the more points they get. The digital customer also sends out a comment on how satisfied they were with the performance of the player. This mechanic is used to make the player reflect on the customer perspective and gain an understanding of factors important to the customer. The mechanic will also create an understanding of the solutions, correlations and consequences (see Bonde et al., 2014). After the result are presented, the player is introduced to a new case (Figure 2).

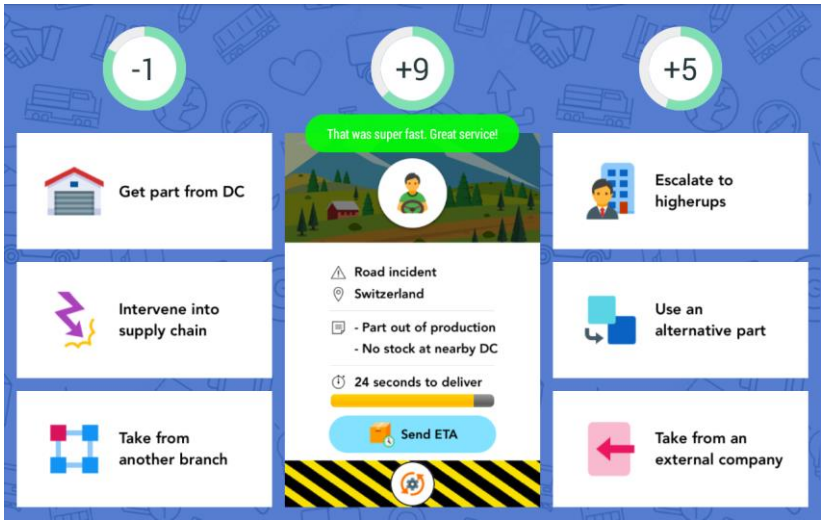

Figure 2: Screenshot of prototype - feedback

Another element to interact with is the "ETA Button". If clicked, it will send out an ETA to the customer which will increase the customer happiness but prevent the player from looking or interacting with the solutions for a few seconds. The use of the button is optional though. When all 15 cases are completed, the user gets an acuminated score and is presented to the details of the results where they can see the statistics about their play through (Figure 3). For a more extensive walkthrough of how the game is played, see appendix 4.

Figure 3: Screenshot of prototype - stats page

4. Methodology

This qualitative study aims to evaluate how a digital game can, from a user perspective, further organizational awareness in an office environment. This qualitative approach aimed at documenting people's' experiences by talking in depth and together gain a joint understanding of their experience with the game. A qualitative approach has a high probability of generating rich and meaningful data (Alvesson et al., 2000). To do this, a three-step user tests was conducted with a prototype designed for the study. The three steps were: surveys; observations; interviews.

4.1. Models

The questions and structure in both the questionnaires and follow up interview were inspired by the frameworks EGameFlow (see Fu et al., 2009) and MEEGA (see Petri et al., 2017) which offers an understanding of what aspects and questions that are important to consider when evaluating educational games. Both models usually gather quantitative data through questionnaires.

EGameFlow is a scale that evaluates user enjoyment of digital educational games and was created as a tool for developers to understand the strengths and weaknesses from a user perspective. The quality of the game is evaluated with a scale of eight factors: immersion, social factors, challenge, goal clarity, feedback, concentration, control and knowledge improvement (Fu et al., 2009). This study did not use these factors directly but rather as a guiding template for structure and content in the questionnaires, observations and interviews.

The other model that inspired the study was MEEGA (Model for the Evaluation of Educational Games) which, similar to EGameFlow, is developed to evaluate educational games. The model focuses on the reaction that students have after playing a game. To measure this, MEEGA looks at three dimensions of the gaming experience: User experience, motivation and learning (Petri et al., 2017). Similar to EGameFlow, this was used to guide content and structure.

This study had a qualitative approach which is why none of these models are directly used but influenced the structure and focus of all three steps of data gathering. Furthermore, the aim of the study was not to directly evaluate the game in terms of gameplay and interaction, but rather using a game as a way to evaluate the concept of gaming as a method for information sharing and awareness. The models were also created for academic settings. Nonetheless, the models provided insight into how games should be evaluated and the reasoning behind the design of the study since they both are method that has been developed for the purpose of evaluating educational games.

4.2. Pilot studies

The initial structure had the participants fill out the second part of the form before the interview. However, after playing the game, participants were more eager to talk about the experience of playing and their initial impressions instead of filling out the form again. This part was instead moved to the end of the session, thus creating a better flow. Some features and mechanics in the game were difficult to understand which lead to a reworked and more thorough tutorial where mechanics were explained in detail. There was also a meeting with employees that were familiar with the project, but not directly involved, where the structure and questions were examined to make sure that wording, structure and content would use correct terms and fit into their perspective.

A test with one student and a playthrough with representatives from Volvo showed that the feedback the game was giving to the players was insufficient and too short to understand if their performance was good or bad. Therefore, adjustments were made to Increase feedback by using more colors and put more emphasis on the result from each case. Customer feedback remained on the screen longer and was color coded in red, yellow or green, based on the performance. Also, additional parameters were introduced to the statistics screen, so the players might see where they did perform well and where they might need to improve in the next game.

4.3. Selection of participants

The selection of participants was a purposeful sampling where a broad spectrum of competence and perspectives was appropriate to compare participants from different professional backgrounds. Purposive sampling (see Silverman, 2013) allows the case to get the insight by looking at it from multiple angles and possibly identify common themes as well as differences between employees with different background, position and profession.

The target group for this study was deliberately broad since the aim was to explore the concept of using games in the workplace from the user perspective. To accomplish this goal, a wide variety of participants with diverse professional background was relevant to gain a better understanding of how employees' perspective and knowledge influence how they perceive the game concept. Representatives from Volvo reached out to different departments within the organization and invited them to participate in the study. 17 employees of different age groups and professional backgrounds volunteered to participate in the study.

Participants	Age	Sex	Prof close/not close to the supply chain	Group/single
P1	50+	Female	Close	Single
P2	29-39	Male	Close	Single
P3	40-50	Male	Close	Single
P4	18-28	Female	Close	Group
P5	18-28	Female	Close	Group
P6	18-28	Female	Close	Group
P7	29-39	Male	Close	Group
P8	18-29	Female	Close	Group
P9	29-39	Female	Not close	Single
P10	29-39	Male	Not close	Group
P11	40-50	Male	Not close	Group
P12	40-50	Male	Not close	Single
P13	29-39	Female	Not close	Single
P14	29-39	Female	Not close	Single
P15	50+	Male	Close	Group
P16	40-50	Male	Close	Group
P17	29-39	Female	Close	Group

Figure 4: Participants

4.4. Study

The test session was conducted in a controlled environment in the office building where the participants worked. critique towards controlled environments have been raised because it is a simplified artificial representation of the real environment it portraits (Alvesson et al., 2000). To negate these aspects, the data was collected in the office building that most of the participants work in. Data was collected in three steps using a triangular approach to get a broader perspective. The intention was to gain cumulative understanding where multiple perspectives contribute to a 'truer' case which will likely improve the quality in the analysis

(Silverman, 2013). Some would argue that triangulation of data is a risk because it takes more resources and time to analyze each dataset and result in a under analyzed dataset. However, being aware and planning for this made it possible to work thoroughly with the large dataset.

Firstly, the participants were given a questionnaire (see appendix 1) where they answered questions about their profession, daily work, experience of games and then more specifically educational games. The questionnaire also asks about specific facts and goals for Volvo Group before and after playing the game to enable comparisons between players knowledge before and after playing the game. A structured format with a questionnaire was chosen in the first part because it is suitable for questions about fact (Lantz, 2013) as well as making it easy to get an initial overview.

The second step was to test the prototype by having the users play the game. The challenge of the game is to gain knowledge in order to make the best decisions, Therefore, part of the gameplay was designed around replayability. The players could therefore decide if they wanted to play again. There was also observation and notes taken during the gameplay session. Even though questions and interruptions are more accepted in a controlled environment (Sharp et al., 2015) the observers stayed in the background except in certain situations where a question was directly aimed towards them. The observation phase was important since it allowed the researchers to take part in initial impressions and reflections of the game by the players, and their experiences.

Lastly, the game session was followed by a semi-structured interview (see appendix 3) where questions posed in the questionnaire regarding organizational knowledge were followed up by asking them again to compare the games impact on awareness. It is important to give the players time after playing, to debrief and discuss what they have experienced, as well as giving them the opportunity to get an explanation of some results and consequences (Wangenheim and Shull, 2009). This was also taken into consideration when deciding to follow up with a semi-structured interview. The educational aspect was also evaluated by asking about their own perception and accuracy of the content. The social aspect was evaluated through questions about challenge, fun, competition and cooperation. The goal with the semi-structures format is to allow the participants to open up and elaborate on “how” and “why” they think and feel about aspects in the game. People in pairs were interviewed separately to make sure that both participants could share their own thoughts without being influenced by the other. However, this structure required a more planned semi-structured interview in order to gather similar data when two people are conducting the interviews. Therefore, themes and areas were decided upon to guide the interviewers to make sure that both talked with the participants about the same topics.

Additionally, beside a triangular approach to data collection, users were also organized into two different categories: single players and pairs. The reason for this was to analyze what the impact social factors and co-operations could have on learning and overall experience. Furthermore, it was concluded that the option to compare single players and multiplayers was essential in order to determine the impact social factors could have on awareness and how groups play the game compared to single players.

4.5. Thematic analysis

The data that was collected from observations and interviews were analyzed using thematic analysis which is a straightforward method of analyzing qualitative data by reporting patterns within the data and determine themes in multiple ways. Because of this, it is important to be consistent in execution within the particular analysis (Braun and Clarke, 2006). The aim of the study was to understand how games can further awareness within organizations from a user

perspective. Too do this, a qualitative approach was used to understand the participants experience which makes thematic analysis a great tool because of its ability to report experiences, reality and meaning of participants (Braun and Clarke, 2006). The interviews were transcribed in full before starting thematization.

The thematization was done in five stages for the purpose of condensing the material and allow for an overview of the data which can then be studied and analyzed (see figure 5). After transcribing the interviews and observations, the first stage was a first readthroughs with some initial notes to get familiar with the material and look for initial patterns. Second stage was to go through the material again and starting to code and take notes of the initial impressions. Second part of this stage was more thurough readthroughs which is where most of the initial codes were created. During this stage, there were also more going back and forth between interviews to compare answers and patterns as well as consistently writing down thoughts and ideas. The writing part was integral throughout the thematization of the material and enabled moving back and forth between thoughts and patterns that had come up during the process. When the codes were created, they were mostly summarizing or descriptive of interesting answers to allow for a better overview of the material. During the fourth stage, the codes were collected and put into categories which were then compared to notes and initial patterns of the first stages. The reason for this was to get a better picture of the categories and if they fit in. No changes were made here so the created categories were kept. There were 37 categories which were analyzed and thematized in different ways which finally led to the thesis final four themes. The fifth stage was to analyze the themes by using the categories to understand the nuances of the themes.

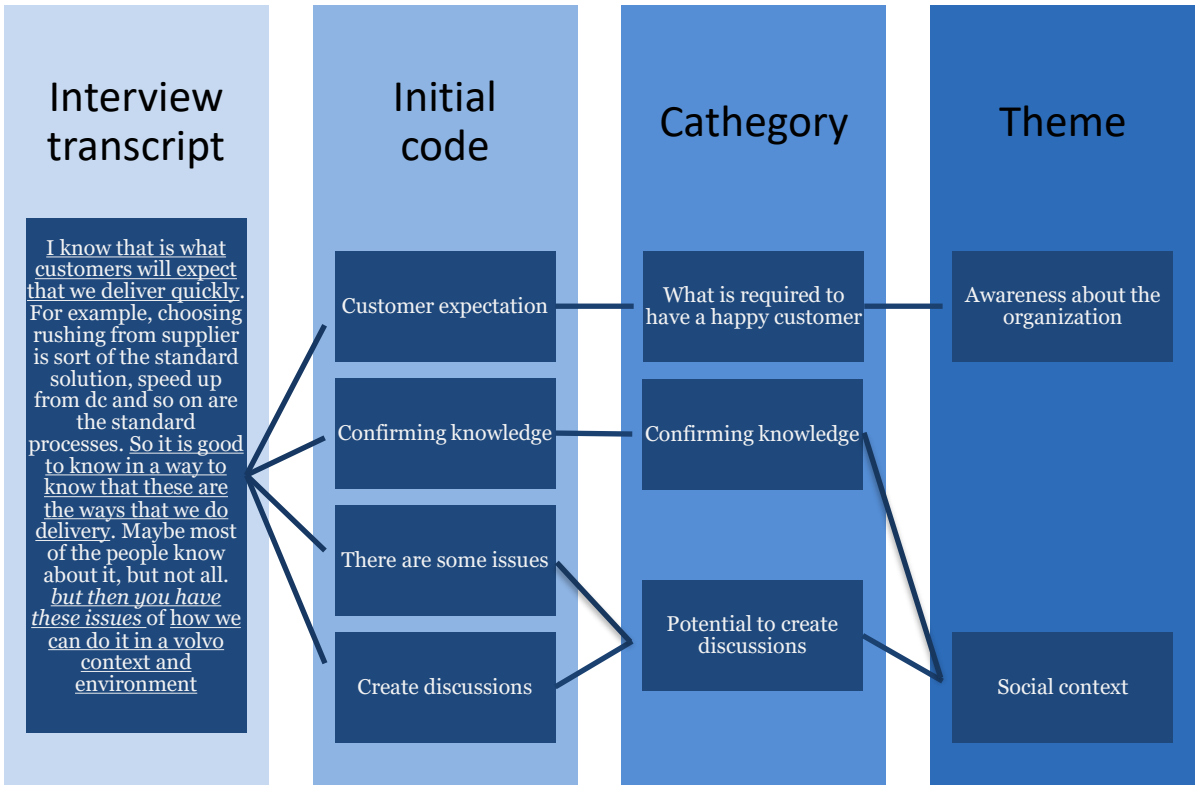

Figure 5: Ranking of spare part delivery aspects (Not working closely with the supply chain)

4.6. Ethics

This study follows Swedish ethical guidelines set out by The Swedish Research Council (see "Etik för Samhällsvetare," 2019) which is based on four requirements: Firstly, *the requirements to inform* the participants about the purpose of the study, their part in the study as well as make clear that their participation is voluntary and that they can quit if they don't want to participate; secondly, *the requirement to get consent* where the researcher need to get the participants consent before gathering data; thirdly, *the requirement of confidentiality* to make sure that participants personal information is handled and presented to make sure that no unauthorized can access it; lastly, *the requirement to only use the data for its intended purpose* which includes not using it for commercial or non-scientific use.

When asking employees to participate in the study, they were information about the study, its purpose and why they were being asked. Before starting the audio recording, each participant was informed about the purpose of the study as well as asked for their consent to audio record the interview. The study also guarantees immunity for all participants which meant that they were not asked to give their names, and only the analysis was only referring to participants through codenames.

Although the study has been created in collaboration with Volvo, the focus of the study always remained on the research. While the game has been made to be used by the company and to explore the usage inside their organization, frameworks have been used to evaluate the study and both the planning for the study as well as the analysis have been done independently.

5. Results & Analysis

In order to get an impression of the results, the data of the surveys will first be presented descriptively. The focus here is mainly on a description of the available data, although a short interpretation will follow afterwards. The results will then subsequently contribute to a triangular analysis.

5.1. Comparison of supply chain workers with other employees

In terms of their professional background it can be said that almost two thirds of the participants (11) work closely with the supply chain. People under this category have jobs in the Service Center, as material planners or in a business role, where they oversee the supply chain. Participants that do not work closely with the supply chain (6) work in Human Resources, Communications, Innovation or more technical roles.

To see if and how the closeness of employees to the direct supply chain work had an impact on the results, it was compared what the differences in the results in terms of perceived knowledge of the end-to-end process and the importance of delivery aspects are.

5.1.1. Importance of spare part delivery aspects

Another way to determine the differences between employees working close to the supply chain and those who do not is to look at how the importance of certain delivery aspects has been ranked before and after playing the game.

Participants not directly involved into the supply chain changed their answers after playing the game to rank key elements in the game higher than before. The participants with the least experience of the supply chain showed the biggest difference in their answers before and after playing the game. All participants ranked the availability of spare parts as most

important for the customer before playing the game, some changed their answers to rank Communication of ETA higher than before, which had the biggest increase of all aspects. The quality of spare parts on the other hand had the biggest drop and was rated the least important aspect afterwards. Speed of delivery and the follow up on orders are perceived slightly more important than before (See Figure 6). The results indicate that the game could raise the awareness about those aspects that played a big role within the game. As the delivery of the ETA had a big impact on the results and the communication responses of the digital customers were also a part of the feedback, players seem to consider it more important than before. The speed was also perceived as more important and is basically the central aspect of the game as the remaining time is mainly responsible for the score after each played scenario. That the quality of spare parts had a big dip in the ranking the after results probably is caused by its complete absence in the game. The level of complexity in the information provided in the game implies that it was suitable for employees within the organization that does not work close to the supply chain.

Figure 6: Ranking of spare part delivery aspects (Not working closely with the supply chain)

Participants working closely with the supply chain have answered only slightly different after playing the game. However, it can be seen that the Communication of ETA and the Delivery Speed are perceived as more important than before, while the other options are rated less important. (Figure 7)

Figure 7: Ranking of spare part delivery aspects (Working closely with the supply chain)

5.2. Impact on knowledge of focus areas and backorder solutions

As the question for the main operational focus areas was open, there is a big variety of replies. Yet, there is a pattern that the participants mentioned areas after the game that are not part of their everyday work or that played a big role while playing the game. The biggest take away here is that costs were mentioned most out of the answers given, with five times to be exact. Actual focus areas, that are being promoted internally, were only mentioned two times. In terms of backorder solutions, besides four participants, everybody stated that they learned one or multiple new solutions. Mostly those, that were not part of their daily work. The solution that was new to most people was 3D-Printing.

The game was able to introduce the players to new backorder solutions that they did not know of before or did not know that they were in use yet. The biggest impact in knowledge and awareness was with participants not directly involved with the supply chain. Those had a drastic change in their perception towards the game related aspects.

5.3. Observations

The observation of the game gave insight into how the participants perceived the game, e.g. if they play in a certain manner or if they show any emotions while playing. Observations also provided further understanding of the social interaction between players in groups where different group dynamics could be distinguished. Some behaviors were shared among most participants such as a low learning curve and a tendency to pick options that were familiar from work. However, there were noticeable patterns that arouse from the observations which were categorized as *expressive single players, reserved single players, communicative & excited teams, and reserved & non-communicative teams*. Players that showed similar behaviors usually played the game in the same way as well as shared a similar professional background. These patterns contribute to further understand how the game and social interaction contributes to how a digital game can further awareness. To describe these types of players and the differences between them in detail, the observations are divided into common behaviors and four player types. Furthermore, the observation also provided insight into how participants reacted and used game mechanics.

5.3.1. Common behaviors

All participants made a nervous impression directly before or during the start of the game. As a first step they started to play the game and test the controls. At this point, the decisions that were made did not seem to be made with much thought, but rather they tried the game out and explored what impact their actions would have. Sometimes they picked their solutions randomly. For example, many players tended to have a first-choice solution but when that was not possible, they selected the solution next to it such as P14 expressed it during the play through:

> *I'm just trying different things just to see what happens, Oh damn! this is not going well*

If that solution was not available either, they selected the solution next to that one. It was very random, as if the participants gambled. It also seemed like they simply wanted to pick a solution as fast as possible which most likely was connected to the time limit.

A change in play that could be observed after a short while, was that the controls and the general game concept seemed to be very intuitive for the participants. They understood the

the game almost instantly and only on two occasions were there problems when the controls seemed to be too small for the hands of two players. Besides that, the flow of the user interactions seemed very natural and it made the impression as if they very solely concerned with the content of the game. The fast paced and random playstyle of the users in the early game rounds started to vanish after a few minutes or at least after they started their second game. In fact, almost all of the players took a bit more time, or at least made a more concentrated impression, during this second playthrough and focused on the actual scenario or context of the case they were currently confronted with in the game. This could also be observed in some of the users' comments during the game, when they talked with their teammates, or to themselves. Participant P7 pointed this out to the teammate:

> We *have to look at the case description. Always check the case description.*

The fast learning curve in regard to the gameplay and the controls could also be seen at the decision making of the players. Although all users started to understand which solutions led to good scores and feedback and vice versa, some started to discover real patterns. This could be seen as they reduced the pool of solutions and followed them quickly and recurrently in the same order. The scores and the customer feedback were positive, which seemed to reaffirm their tactic. While this behavior could be observed with almost all participants, there were bigger differences between the players when it came to their reactions, emotions and body language. Here the field of participants seems to split into four different groups.

5.3.2. Expressive single players

This group of players was very loud, showed a lot of expressions, emotions and made commented about the game and their own performances. The emotions and phrases the players made seemed very natural and one could even sense a bit of nervousness, at least in the beginning of the game. Here the players expressed terms like "Oh my god, it already starts!" or "I hope this goes well!". While playing the game they started to comment on their own playstyle and the game feedback, "Oh shit!" or "Ah, now I get it!" were phrases that were used. But they also commented the feedback they got from the (in-game) customers. Here they directly answered e.g. "Yeah yeah, I know!" or "Oh, sorry". In general, there were also a lot of laughs or other signs of emotions like "Wow!" or "Oh!". Basically, the game was commented almost the whole time with remarks or with verbal expressions. Notably, all players that can be described as expressive also share the similarity that they do not work closely with the SML process but in fields like HR or Communications. One could assume that their expressive nature was caused by some nervousness as they did not really know what to expect and dove into a field that they do not know that much about. This can also explain why they had a rather negative outlook on their performance before the game started. When the results got better though, these players voiced that they indeed have what it takes to be successful in this game and became more confident. Hereafter, attitudes turned extremely positive and was accompanied by a lot of laughs and positive expressions about understanding more and having fun.

5.3.3. Reserved single players

These players showed little or no reactions throughout the whole game. At a few occasions they asked about the gameplay, but rather in the style of "How long do I have to play?". While

playing they made a concentrated but also bored impression. They were among the players that discovered pattern on how to beat the game. When they did, they simply did the same thing over and over again, which again seemed to bore them after a short while because of the lack of challenge. Everyone in this group works close to the supply chain and they have thorough knowledge about delivery options and procedures. Their expertise might be the reason that the game did not bring out any reactions, as the complexity of the gameplay was too low. Furthermore, this group was asking about aspects of the game and whether there would be more levels. This indicates that the bored and concentrated manner was because of this lack of challenge and that a game with more progression and surprises would intrigue this player group more.

5.3.4. Communicative teams

With some teams, the playthrough developed into a very active and loud game session. These teams were in a constant state of communication, talking permanently about the circumstances of the current case, about the solutions that they could use, about the remaining time, about the points and about feedback they earned. The atmosphere when these teams played was very positive and engaging. The communication was not only focused on the game, but was also characterized by banter, teasing and taunting, though never in a negative way. As an example, some teams were mocking each other after a streak of bad decisions, but gave a positive feedback when things turned around. Then they said things such as “Oh, you are very good.” in a sarcastic tone. The playfulness even included physical interactions where players were nudging each other and laughing about their decisions and mistakes. Beside the fun and playful atmosphere, players still took the game seriously and tried to achieve good results. They were pushing each other when successful and tried to analyze their performance and what they could learn from it. Though, you could see that the time pressure forced them to communicate very quick and short with precise commands. During the decision-making process, the knowledge and expertise of the team-mates was combined. They discussed and made suggestions which they then commented on. For instance, when one player wanted to pick a solution, the other player quickly intervened by saying it would be too expensive, thus teaching each other and discussing options in a natural way. They also reminded each other to focus on the circumstances of the case they were playing: “We have to look more at the description”. Another team worked together by having one player reading the scenario out loud and the other executing the solution that they agreed upon for the specific situation. Here the teams strongly benefited from the cooperation and tried to develop and argue for the perfect solutions in specific scenarios which increased enjoyment and awareness.

5.3.5. Reserved teams

Some of the teams did not develop a good level of communication. These teams, although communicating in the beginning of the game when they learned the game mechanisms and controls, split up in a more active and a more reserved player. This behavior seemed to develop when the two players were unsure what to do or when they had opposing opinions. One of the players then took the control and executed a solution without discussing it beforehand. Throughout the game, this behavior solidified itself and one player kept on making decisions, even when the other player had a suggestion e.g. sometimes you could see the active player shortly think about the team-mate’s suggestion, but lastly still making a decision on their own without. Thus, the reserved player became a quiet spectator, while the active player played mostly independently. The reason for this was the time pressure which forced the players to

be more effective and made some focus more on fast executions than cooperation. Other teams developed these roles more intentionally. One of the players knew that there was little time for discussions and not enough space on the tablet to sit there and play it together. They pushed the tablet in the direction of the other player and made a gesture that their co-player should be in charge. On a few occasions they would still give suggestions and their partner followed up on that. Here, the uneven distribution of the roles seemed less like a power play, but more like a conscious and necessary decision because of the time pressure.

5.4. Interviews

The conducted interviews have been interpreted using a thematic analysis. Identified themes have been compared and evaluated together with the results from the surveys and observations. All of the participants are anonymous so quotes and references during this section will use codes in order to distinguish each participant without disclaiming any personal information. Four themes were identified from the thematic analysis: *Improvements to the concept*, *Learning and reflection*, *Understanding & awareness* and *social & fun*.

5.4.1. Improvements to the concept

This category is about the points of improvements that people mentioned during interviews that would make the game better. One aspect that every participant was requesting was longer time to reflect and a better feedback on how good or bad their choices were. The game gives feedback in the form of points as well as customer reactions but in order to understand the score, there would need to be more of a context such as a leaderboard. The lack of understanding their choices could also be contributed to the pace of the game where the next challenge started a couple of seconds after the choice was made instead of allowing the user to proceed at their own pace. With a focus on increasing awareness about the organization, giving the players time to understand the impact of choices would be an improvement that would have helped players to reflect and gain further understanding of the delivery process.

Another area of improvement was the complexity which some would have liked to be increased to make the game more challenging. This was particularly common amongst people that viewed the game as an educational tool for experienced people in the supply chain. It was also an aspect that was brought up more by single players that was seeking more challenge. Increased complexity would add more specific aspect of learning to the game. Suggested ideas that could add complexity were circumstantial effects such as more parameters or more information to consider in each case. Although, not everyone agreed. Multiple people expressed an opinion about enhancing the playfulness of gaming is what makes it fun. P6, who works close to the supply chain and played the game with a college, meant that a game to close to reality would not be fun:

> *I like some realism, but not to an extreme because then it wouldn't be fun. it would be my job on a game platform (...) it is more fun if it is a bit unrealistic. because it gives you this sense that "wow"*

This is however not a difference in opinions of design, but rather, in context. Users that wanted a close representation of reality viewed the game as educational, thus the need for a close representation of reality is important when there is specific information that is meant ot be communicated. The participants with similar opinions to P6 viewed it more as something fun with the potential to spread awareness and perspectives within the organization.

Furthermore, the ETA-game mechanic was a design flaw because of its placement in the order of handling a case. The players were supposed to send an ETA before selecting an option. However, participants were confused by this because there is no way to estimate the time of arrival without having decided on the solution. This misconception of how to use the mechanic resulted in players trying it once or ignoring it completely since the inaccuracy of the mechanic disrupted the rest of the experience.

5.4.2. Learning and reflection

A majority of participants felt that the game was a close representation of the real delivery process except for the fact that it was a simplified version. This was especially notable among participants that work with solving orders in the supply chain every day. Most of them saw this close representation as an opportunity to show other departments what their work looks like and suggested departments that should play it to get an understanding of the challenges that they face every day.

During the interviews, half of the participants mentioned that they learned something. New solutions or changed perception of how the process works or the perspectives of both customers and coworkers in other departments were the most common things participants learned. The commonality between the participants who were influenced the most, is their roles within the organization which is not directly connected to the supply chain. People in roles closer to the supply chain rarely expressed a clear learning experience. These results match the survey results, where people further away from the supply chain changed their answers more after playing the game compared to the people close to the supply chain. P9 expressed it clearly where the game feedback taught their about specific options as well as why they are good options:

> *I was using "dealer option" but then I got the feedback from this game that it is actually a better result if I take it from the production than from external dealers. Also I get feedback from this result that it seems "speed up goods reception" is actually good because it sometimes solves the problem without a lot of cost*

Participants were also introduced to new aspects of solving back orders with the most notable of being 3D printing, which can be somewhat expected since it is a novel solution within the organization. Furthermore, everyone adapted to the game rules to get as high score as possible, even though they were skeptical sometimes to the higher point solution. Some even had a safe choice that they knew would at least give them a few points. As exemplified in how P14 describes their reasoning:

> *the initial choice was based on what I knew and then, if that didn't work, I think a couple of times I tried maybe two choices that didn't work, and then ok, now I take the one I know will work*

These results indicate that games can be used to introduce new strategies where employees can experience new implementations instead of only hearing about them. Participants also saw this as a tool that could disrupt work habits by being a friendly reminder or challenge

established thought patterns. Introducing cases with different solution, employees can see the bigger perspective and be reminded of how it all works as P6 describes:

> *So if only a minimum increase in awareness of the importance of the ETA for example, then it is a plus because people tend to, not forget, but neglect the importance of some duties (...) then this is a friendly, it is a fun reminder so to say, which is your priority*

This reminder also prompted a discussion from a majority of participants regarding perspective and other possible solutions.

5.4.3. Understanding & awareness

The theme "understanding & awareness" is about how the game impacted the participants understanding of the organization.

5.4.3.1. Increased understanding

The game enabled players to operate as the entire organization by allowing them to solve problems with every disposable option. This gave participants a holistic view of the company and the numerous parts involved. P13, when talking about their preconceptions of the process issues were challenged by the game:

> *sometimes it seems so clear, just send the damn part! But there are a number of aspects to take into consideration (...) how much time it takes, what to say to the customer and also, I'm not sure how easy it is to rush from a supplier, I don't know. It makes me at least think more, maybe it raises more questions than actually give answers, but maybe that is not a bad thing. Maybe it is good.*

Not only did it challenge preconceptions, but it also gave participants new perspectives. Part of the new insight for people not directly involved in the supply chain were a better understanding of what it requires to keep customers happy such as the importance of communication and the challenges of balancing cost and customer service. When asked about how they perceived the games representation of the business and the difficulty of striking a balance, P14 described it as somewhat accurate but that the customer feedback made them reflect about the current situation and how the game promotes a service minded mentality:

> *It is difficult, you would rather solve the case then maybe put the time into giving a new ETA (...) I mean, I can really understand that. (...) you are customer oriented because you want to make sure that the customer gets it but you don't maybe see the value in giving, putting the time into giving the ETA. Even if that means that it will be a bit of a delay*

Some even went further and embraced the game by only focusing on having happy customers and that factor is what they see as the most important focus for both the company and the gaming experience:

> *at least the cost, we are here to play to at least have a green customer. For me that is the main thing that i do think prolongs the game (...) when you told me to game, I thought "ok, cost = pfft" we need to, it is just a game. I don't know why but my main focus was "let's make sure that the customer is happy"*

The game also provided a sense of urgency by having 24 seconds ticking down from the start of each ticket which players really responded to by both feeling the urgency in every decision but also in their understanding of the time-factor. People close to the supply chain mostly saw this as a somewhat accurate representation of the urgency that can occur when delivering spare parts as P12 described when they were asked about the urgency:

> *It is some kind of stress factor, of course as it should be*

It was also a challenge that people felt they had overcome by the end of the second playthrough and mentally transformed into a timeframe to work within as described by P1:

> *first you are panicked and you just grab something, but then, if you just calm down one or two seconds, you might find another option (...) The main thing was that I started to read more carefully, I didn't focus so much on 24 seconds, of course I looked at them, but I read through them because then it helped me*

However, the game mechanic was somewhat divisive among single-players where two opinions could be distinguished. One side didn't like the mechanic because it prevented them from reflecting on the feedback and understand their choices. This group also tended to view the game more as a learning tool where the point was to learn details about the delivery process. The other group liked the mechanic because it was a good representation of the real pressure that can occur. This group tended to view the game as a fun simulation that can spread awareness among employees. The participants that play in pairs all saw the time pressure as a negative part that only disrupted communication.

5.4.3.2. Awareness about the organization

Every new case in the game had some choices that gave positive scores, some that gave negative scores and some options that did not work for that specific case. However, participants could not see the effects of each choice before making a decision, and after, they could only see the result of their selected choice. The design was meant to encourage exploration and critical thinking. Yet, the participants tended to go for choices that they were the professionally familiar with, or personally preferred to be the best choice in the real process. Even though, as mentioned before, people did adapt to the game rules and selected the choices that gave the most points. They often did so within their preferred frame of solutions. When asked about if they based their decisions on personal knowledge, P2 specified that it is more about personal opinion:

> *no not really based on my personal work but more based on my personal opinion. Because I, lets say, am not working in*

> *operations and not involved in anything with other DCs. but how I would see things. As I mentioned, 3d-printing is something which I have used more because I know how it works and so on*

The reason why people did not explore as much as expected could be explained by the point system and the feedback. Because it is a point system, people wanted to compare in order to understand their own score. Without that trigger of knowing how many points you need in order to beat the other players; the intrinsic motivation is reduced. When players only played against themselves, there might be more of an incentive to explore how good your professionally preferred options are compared to other solutions.

Participants were also introduced, or made more aware of other departments which gave the sense of "wow" as described by P6:

> *it made me feel like "woow!" for example, VOR has very good mandate, they can get from everywhere and they have a better toolbox to solve the problems*

But the game also gave the perspective of what happens before or after you are done with your part in the chain. Such were the case with P11 where they do not see what happens when their work is done:

> *for me it is a super tool, at least all people outside of SML first of all to understand a bit of what is SML and what is real world (…) sometimes you are really focused on the product and sometimes not so much product on the road or what is happening. When you design your engine, you never, ever, ever think about broken truck mixer in Germany. It is a good example like this, you are only concentrated on your engine. Here it is a link with the real world I would say.*

The holistic perspective in the game made people see the delivery chain and process from a new perspective. The ability to influence employee's organizational awareness lead to discussion about what the bigger goal is that everyone works toward as P13 put it when asked about why everyone should play it:

> *I think it could create a sense of urgency, because everything we do in our daily jobs should at least bring something to our end customers. Everything we do should be a part in the supply chain, in one way or another.*

Other participants saw this potential as well. P6, who works close to the supply chain, wanted a game where they could play through a strategy and learn more about the company's future strategies. To them, the most important part about their job was the matter of proactive work to prevent back orders:

> *number one for me is not ETA or availability, number one for me is the pro-activeness, to prevent BO so you don't need to care*

about availability or ETA, because you are trying to prevent. So that should be the number one focus

It was suggested that it could be a possible expansion to the current game where the player would play a strategy game to prevent as many backorders as possible and then solve the ones that the player was not able to prevent.

Furthermore, multiple people thought the concept was a great way to get an understanding of how the delivery chain and backorder solutions work. which were seen as a great introductory tool for new employees. One participant even wanted the game to be a part of the future onboarding strategy that she was currently developing. In addition, playing a game from a department's perspective was also seen as a way to offer people from other departments a substitute for shadowing someone. Allowing them to play the game could be much more time efficient and an easy-accessible alternative to more traditional introduction activity.

5.4.4. Social and fun

This theme includes parts about what made the game fun, what participant liked about the concept and their thoughts on their social context during gameplay.

5.4.4.1. The social context

A majority of participants saw the game as a social experience or would prefer it to be a social experience with both competition and cooperation. P1 saw the game as an energizer and a great way to start team meetings:

this was really an energizer (...) start with this before a meeting, I mean 15 minutes to start up and get energized

The cooperative elements were something most single players saw as the natural way to play it, which the multiplayers agreed with. Some, such as P11 didn't even see a long-term use for the game if it was not to be played with or against others:

I personally don't really believe that people will play alone one it. I mean, they will maybe play first time because they are curious and want to discover. Ah a new toy. I'm not sure that they will come back and retry different things

However, it is worth mentioning that some participants expressed a wish to play single player and that the game has other purposes which does not requires people to replay it multiple times. Furthermore, found through the observations, groups tended to have more fun and most of the group participants did state positive opinions about playing together with people and that they learned from each other such as the experience for P8 about playing with their more experienced colleague:

she is very experienced, she has worked in Gent for like a few years, and then she is here in Sweden (...) It is like, sitting with your colleague, it is always more interaction and also have their viewpoint, like "ah okay I might think that this is some

way" and she has a different way. Maybe she has different way and that is more correct, so you get a better idea

Among all teams, there were a cooperative approach where participants wanted to discuss and reason with each other and learn from each other. Additionally, people wanted to compete and compare with their co-workers and the other participants. All participants saw the game as a medium to encourage social interaction and spur discussions, P11 explains:

I mean, what is interesting is to play against each other just as a first stage, "let's face of, lets compete" kind of things, but of course, the opponent can trigger a dialog. "Ok your team have a very bad score and you have a very high score". Ok good, but now let's dig a bit into the why. Why is it such a low score? Why is the customer unhappy with your choice? You have a very high score, why? Why according to you? That is a dialog trigger. But at the first stage there can be a bit of competition you know?

5.4.4.2. Fun and positive experience

The general attitude towards using games at work was very positive. All participants expressed that they wanted to use games, even though the area of use varied between them, but the overarching attitude was similar to how P2 explained:

I'm a big believer in gamification and games in general and how we can use it better today and turn the boring things into more fun things. Turns them from "have to" to "want to".

A majority articulated a positive experience from playing such as P13:

it was really fun! I think you could see me smiling

However, having fun while playing was not the only positive experience. P8, who recently started their current job, meant that the game gave them a safe space where they could test their knowledge. This gave them a confidence boost by confirming their own competence which they liked since there is a lot of doubt and uncertainty as a new employee:

when you know things, sometimes it is like, you have to make sure, and I have to ask my colleagues that I'm doing this, is it right or wrong. But in the back of my mind I know that you are doing it right. And when you are doing it wrong, then you ask. But now after playing the game I think I'm 70% right

Furthermore, playing the game was also perceived as a medium that could replace some current activities, in particular workshops, presentations and team building activities. The reason for this was to give a fun alternative to boring activities in order to engage people more, as P6 puts it:

> *To communicate this need for a shift in focus, then what would be more effective than that? To have it in a fun way. Because I could be the top boss and come to your team and say "yeah, the ideal future state of the company and SML is to do more prevention work". Then I give you this 15 minutes presentation and then I go. Tomorrow, would you remember this? Or would you give it much thought? No. But if you have it in a fun way, that is more user friendly, and more down to your normal routine*

This way of using games could engage more employees and have an interactive way to both introduce new strategies and give people an option to try out and understand for themselves why a strategy is important.

It was noted during the observation that the game was easy to use by the change in how they interacted with the game. This was confirmed in the interviews where participants often expressed how easy it was to use as one of their first impression. The easy usability was seen as a big strength which gave inexperienced players confidence. Furthermore, participants viewed the accessibility as a key feature if the purpose was to go wide within the company and have as many as possible play it. The shortness of a play session, only being 2-4 minutes, added to the perception of being a very accessible game in that it could start of a meeting and does not need a long introduction to new players. Lastly, some participants liked the use of games because it felt modern and gave an innovative impression by using digital games.

6. Discussion

The aim of this study was to evaluate how a digital game can further awareness of an organization from a user perspective. Specifically, it looked at three aspects which were: social interaction, professional background and context. To answer these, a game concept was designed, and a prototype was built to then be tested by potential users. The study used surveys, observations and interviews to collect data. Thanks to having used data from three perspectives in the analysis, the claims that has been made in the analysis are stronger because they can often be backed up by more than one data source. Results show that a digital game can further awareness of the organization by letting employees play and experience key aspects, which in this study was the process of solving and delivering spare parts. The most significant increase in awareness was seen with participants whose work is not directly involved with the supply chain. Players working close to the supply chain only showed a small increase in awareness. The reason is that the general information in the game content was perceived as too easy for participants working close to the supply chain. An increased complexity and challenge would most likely result in similar increases in awareness. Even though the information was familiar to participants with deeper knowledge of the supply chain, there were other relevant aspects that resulted in changes of perception or new insight. An example was how they gained a better understanding of the organization on a holistic level e.g. being reminded of solutions or new input on the importance of customer service which can be seen as an increase in awareness. The implication of this result is that it could create new ways for organizations to communicate. It would not replace larger proportions of internal communication, but rather change how information is perceived. Departments can

communicate their goals and issues through game challenges which other employees can play and experience.

This study has, among other things, evaluated how social interaction influences how gaming can further awareness. From observations and interviews it was found that the social aspects of playing together are preferred by most employees and were important for co-learning both during and after gameplay. This builds upon existing research on how games can further knowledge by providing a safe environment (Pfahl et al., 2001), where players learn together. Part of the social experience is discussing problems in teams, which helps highlight different perspectives, thus increases awareness which could also become a method for building stronger relationships within teams. Social aspects of play open possibilities for more cross-functional collaboration, where employees from different departments could play together. Diverse perspectives will influence discussions and contribute to better understandings of other departments' goals and struggles.

Some participants wanted to use the game as an introductory tool for new employees, which would arguably make the onboarding process less social compared to shadowing more experienced coworkers. Scheiner (2015) concluded that social aspects are important in gaming when they are implemented in office settings as multiplayer games tend to be better received than single players games. The findings in this study were similar, showing that social elements such as cooperation and competition were requested from many participants. Players also requested to know how their score compared to other players', which concurs with Ruhis (2015) who found that social aspects provide players with a context. This was particularly noticeable when participants knew each other and wanted to beat their friends. Competition was, for many players, more important than collaboration, which goes against earlier studies (see Farzan et al., 2008) which concluded that games with collaborative elements are more effective than competitive when used over a longer period of time. The reason for collaboration in said study, being more successful than competition was that there were only a few people at the top who cared about the score. However, in this study, the concept was only meant to be played in short sessions which made the competitive aspect more enjoyable. This indicates that single play sessions can use competition more because every player is back at zero next time they play the game. The competition could also provide context for further discussions about why some people get a better score than others.

As stated by Perryer et. al. (2016), points in of themselves are not enough of a reward, they need to represent something more which was apparent in this study as well. The quality of a solution in the game was communicated to the player through points. All three datasets indicate a lack of understanding the accumulated score because without being able to compare the score, the result only became a number. Having a number without representing an accomplishment made it feel arbitrary since 200 could be good if the other players only got 170, or bad if everyone else got 250. Instead, most players focused more on the customer feedback because it was a more concrete and understandable. To include a score board where participants could have compared themselves other players would have added a lot in terms of understanding the value of their score.

The player's feedback on the time mechanic and the ETA-button gives an interesting insight on the creation of simulation games. While the time pressure during the game was described as realistic and a close representation of the feeling during the actual work, players recommended that this aspect of the game should be removed in the future, to enable better communication and reflection. The ETA-button was criticized heavily for its function that did not fully match the real world. Some players therefore did not use it, others simply forgot about it, as it did not fit into their real-life workflow. This shows two things for further simulation

games: Firstly, a simulation does not need to include all elements of a real process to be representative, in fact, some aspects should be left out if it makes for a better experience. Secondly, should an element be included in a simulation, it has to follow the same rules as it does in reality. If not, players will be irritated and need time to adapt or will ignore it if possible. Game mechanics that portray real processes need to be thoroughly understood before implementation.

Storytelling can be another effective way to give players motivation (see Scheiner, 2015), which were explored in this study by giving real life scenarios and context to cases so participants could picture the situation. Data from both observations and interviews confirm that participants responded very well to emotional triggers such as a comment from an angry customer. Also, after the game, participants often talked about how they had gained a deeper appreciation for the complexity that many departments deal with. Based on these results, a recommendation would be to use storytelling and scenarios throughout the company so departments can experience the goals and challenges that other departments are facing.

Results regarding context also echoes previous research (see Hamari et al., 2014; Ruhi, 2015), finding that the most effective way to implement games is to do so in already established contexts. This study did not test different implementations so there is no data on how different implementations are received. However, during interviews there were specific questions designed to get a user perspective on how they would want games and gamification to be implemented which arguably is also important for a successful implementation. For many participants, the game's accessibility and short playtime were both appealing features that would make it easy to implement in existing contexts. Some suggestions were: starting up meetings with the game as an energizer; a way to start discussions; making the game be a part of an introduction for new employees; replace part of presentations with a game so people can experience new information instead of only listening to it.

Research has also stated that games are great at teaching skills and reinforcing knowledge (see Kretschmann, 2012; Peixoto et al., 2011; Wangenheim and Shull, 2009). The results from this study confirm that games can further awareness. Furthermore, it can also be said that awareness can be influenced by playing a digital game by experience the delivery process from another perspective. Another interesting finding in relation to spreading awareness is the fact that everyone, regardless of professional knowledge and background, adapted to the game rules, even though it sometimes went against their prior understanding of specific solutions. This can have some interesting implications for how to use gaming in companies since most people are willing to adapt to game rules to get a good score. This potential to influence people's way of thinking could open up areas such as new methods for communicating information of new strategies or breaking habits.

7. Conclusion

A company needs to not only be capable to acquire information but also spread it internally. Spreading awareness in organizations has been proven to be a vital part of creating an organizational identity and a sense of unity and meaning (see Dibrell et al., 2015). However, exploring how games can be used in this process, as this study has done, has not been researched before. The conclusions that can be drawn from the results are that games and gamification have the potential to play a significant role in how companies share information and enhance awareness among its employees. The study can also say that it is possible to design for the purpose of creating an understanding through games. The implication of this is that companies can design games for a specific purpose and then let employees experience it.

7.1. Contribution

This study contributed to establish an understanding of how games can be used to spread awareness within an organization. It showed that a game can influence how employees rate the importance of certain business aspects, by making them a key element in the game. Social interaction, context and professional background have been proven to be key aspects that need to be considered when designing for awareness.

In addition, the study contributed with a functional Android game, that itself is supporting the recommendations of gamification and the raise of awareness. It portrays the processes within the Volvo SML supply chain and can serve multiple purposes within the organization.

7.2. Limitations

Four out of five groups in the study were from the same department which resulted in less variety on how professional perspective influences the group dynamic compared to if the groups would come from different departments. This could have skewed the results by an overrepresentation from one department when analyzing group dynamics. Furthermore, there were no single players from the same departments that group players worked in. To have both single players and multiplayers from the same department could have benefited the analysis by comparing the group dynamics and single players from the same professional background.

Employees were also participating voluntary and therefore showed an initial interest in the game. This could mean that they had a more positive attitude towards gaming compared to the average employee, hence, influencing the result to be more positive than a random sample of participants could show. Additionally, the topic of games and gamification was a novelty within the departments and people might have had a certain level of excitement to test it which could also be contributing to a more positive result.

The prototype included multiple focus areas and game mechanics which made it difficult to say the exact effect specific game mechanics had on the results. The study aim was to understand how a digital game can further awareness from a user perspective which was the reason for creating a game concept and testing with potential users. However, the effects cannot be tied to specific game mechanics since they are working together to create the player experience. Part of this would also be to do more extensive testing on how much of an increase in awareness there is from playing.

7.3. Future research

As the approach of the study was to gain an initial understanding of how a digital game can spread awareness in an office environment, the study cannot answer specific aspects of implementation and how it can differ for different departments and circumstances. Future research is recommended to specify the target group and create specific solutions to further understand how different departments can use games to spread awareness. Part of specifying target group would also make it possible to research the complexity of the game, as well as how a game concept can be used long term. There is currently very little research on the subject of longevity, particularly in organizations, which means that very little is understood when it comes to understanding how games can work long term. Understanding specific game mechanics in relation to how they can contribute to longevity would be an interesting approach.

Furthermore, future studies could explore multiple ways of playing together since the result from this study show social factors to be very influential for the player experience. Some

suggestions from this study is that the game could be enhanced by making people play multiple parts of a process one after one, or by having players collaborate with others which could bring new insights on interdisciplinary knowledge sharing.

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Appendix 1: Pre-game survey

Demographic Information					
Profession: A short description of your department and your daily work					
Age group:	☐ 18 to 28 years ☐ 29 to 39 years ☐ 40 to 50 years ☐ Over 50 years				
Gender:	☐ Male ☐ Female ☐ Other				
Game Experience					
How often do you play digital games?	☐ Never ☐ Rarely: from time to time ☐ Monthly: at least once a month ☐ Weekly: at least once a week ☐ Daily: every day.				
Have you ever used games in your workplace?	☐ On multiple occasions ☐ One or two times ☐ Never				
Describe shortly what your expectations are before playing the game:					
About Volvo					
What aspects of delivering spare parts are the most important to make customers happy? (Rank them from one to five, one being most important)	Speed of delivery	Quality of spare part	Communication of ETA	Spare parts availability	Follow up on cases and being proactive
What are the three main operational focus areas that SML is striving to perfect?					
How familiar are you with the end-to-end-process of spare part delivery? 1-5, 1 being very familiar.					
What options do SML have when solving a spare part back order?					

After game survey

About Volvo					
What aspects of delivering spare parts are the most important to make customers happy? (rank them from one to five, one being most important)	Speed of delivery	Quality of spare part	Communication of ETA	Spare parts availability	Follow up on cases and being proactive
What are the three main operational focus areas that SML is striving to perfect?					
How familiar are you with the end-to-end-process of spare part delivery? 1-5, 1 being very familiar.					
What options do SML have when solving a spare part back order?					

Appendix 2: Observations

☐ Expressions of fun
☐ Expressions of frustration
☐ Is irritated
☐ Hesitates
☐ Plays fast
☐ Asking questions

Comments

Pairs

Communication	☐ A lot ☐ Little
Atmosphere	☐ Friendly ☐ Competitive ☐ Aggressive
Decisions	☐ Dominated by one person ☐ In the team

Comments

Ask them if they want to know the other participants result.

Appendix 3

Follow-up to the questionnaire:
Did you think different about the questions after playing the game, compared to before?

UX

- What is your impression of the game?
- What did you think of the gameplay?
- How challenging did you find the game? *What were the most challenging part? (tasks, time?)*
- Did you reflect around the time urgency in the game? *Would you think that sense of urgency is representative of the real process*?
- What do you think of the feedback from the game? *Did you understand when you made a good or bad decision*?
- What did you think of the point system?

Social

- Would you think competition with other people would make this more fun?

Educational

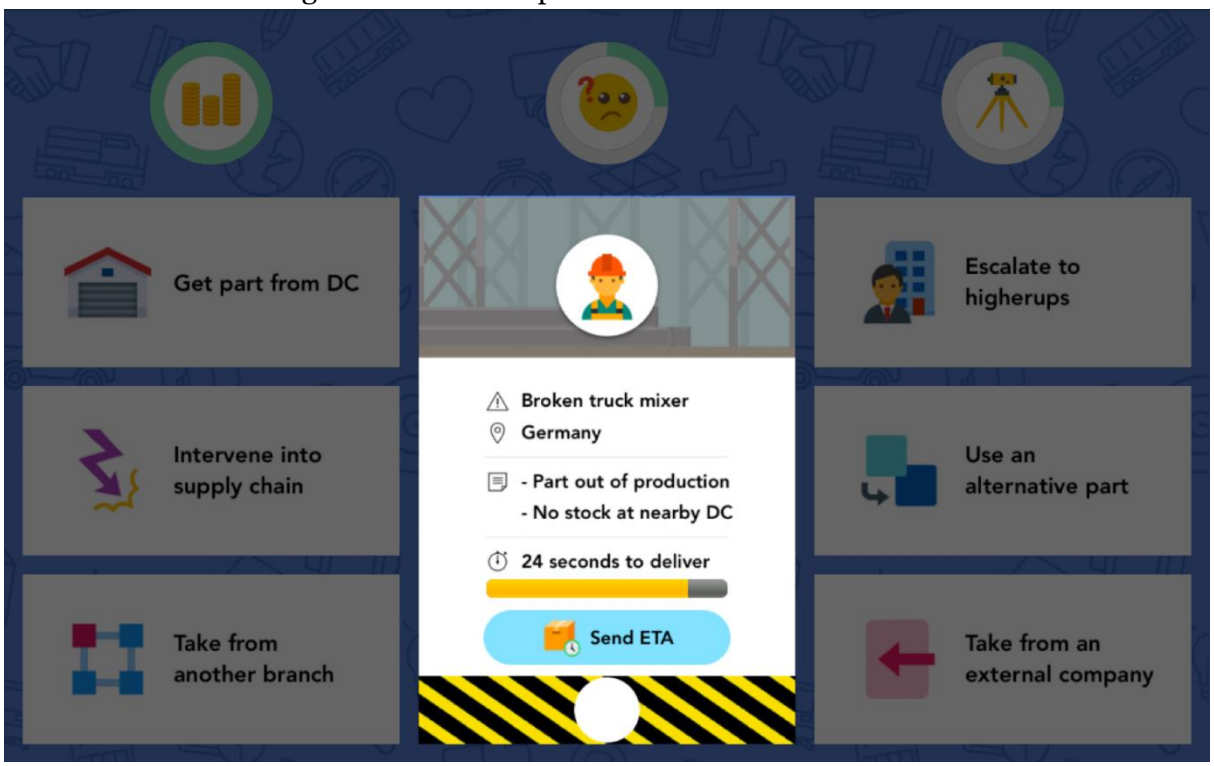
- How would you say the game simulates the process of delivering spare parts? *Simulates challenges and goals*? *Was there any important part missing from the game?*
- Did the game made you think or reflect on new aspects of SML and maybe the spare part delivery process specifically? *If no, why? Is it because of prior knowledge or how the information of the game is presented?*
- Could you see this game being used within Volvo? *How and for what purposes*?
- Would you like to see more game initiatives within Volvo group?
- How did your professional knowledge influence your decisions in the game?

Wrap up

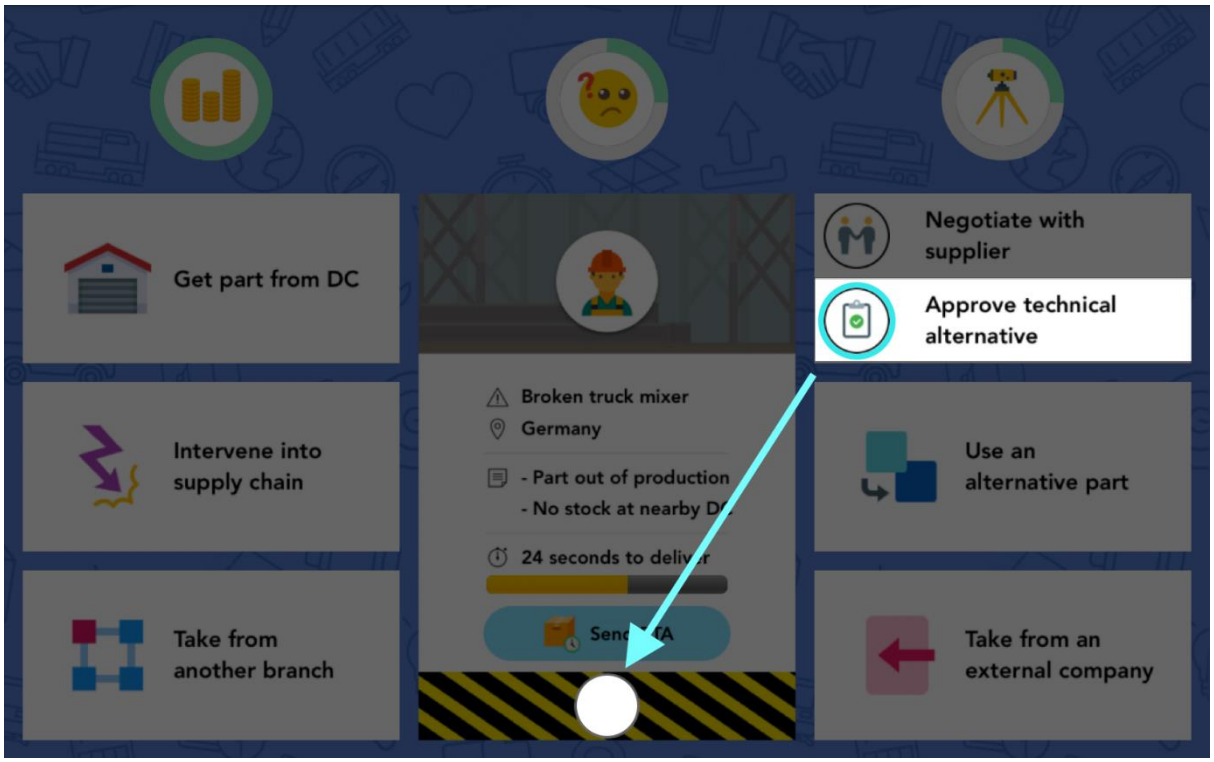
- Was there something that you liked or disliked about the game? *Or stood out in any way.*
- Any further comments?

Appendix 4: Game manual

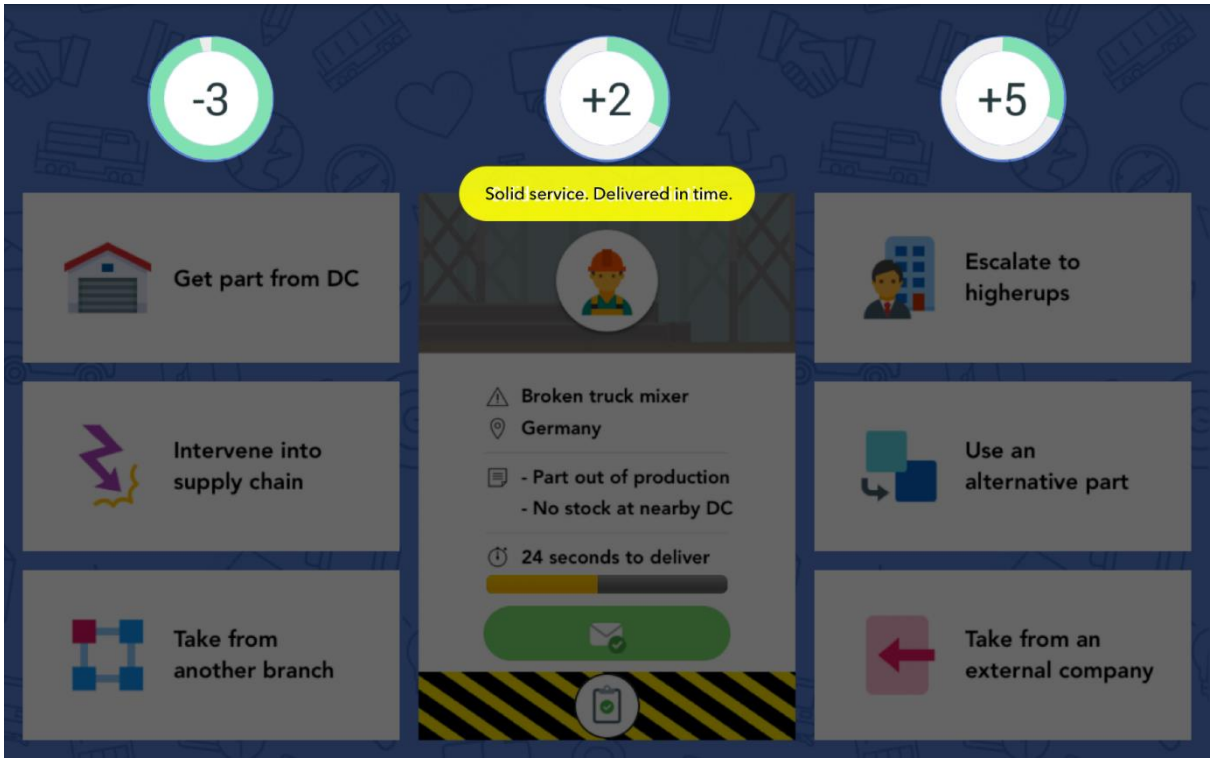
Step 1: The player is presented with a (new) order and has to come up with a solution based on the context and details given in the description.



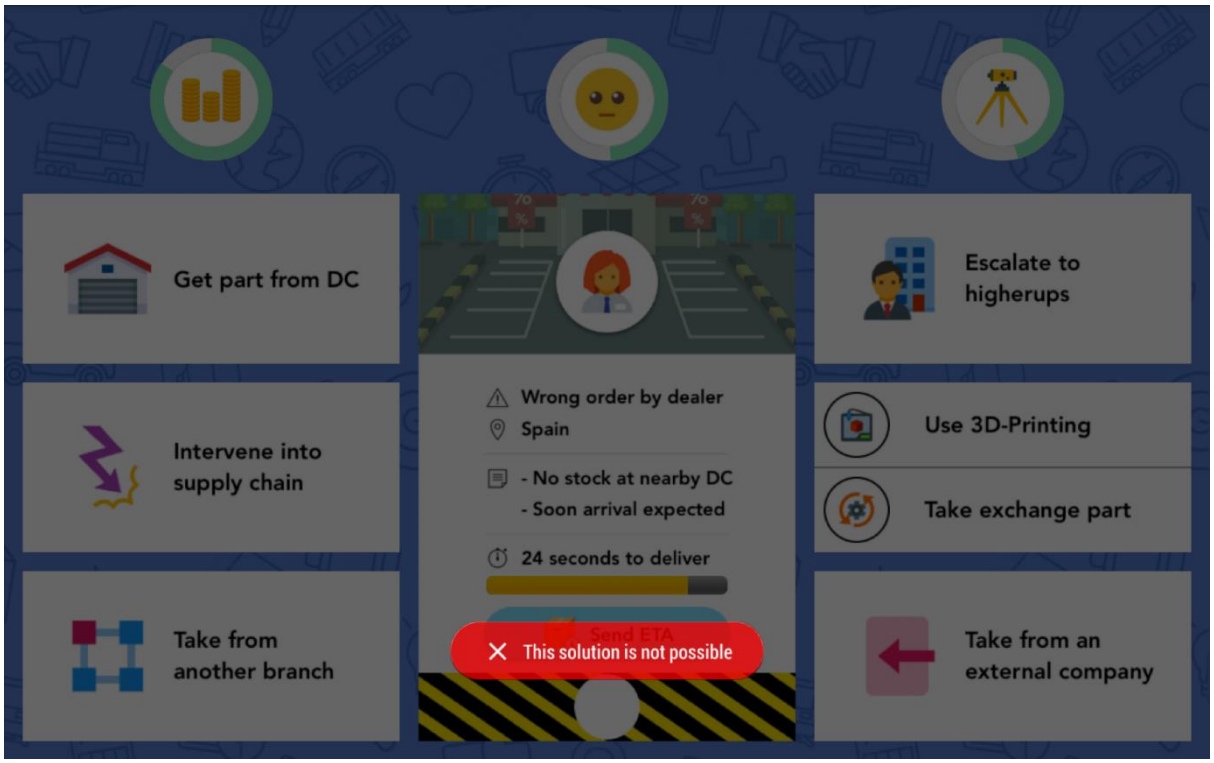
Step 2: The player clicks on a category to reveal the two sub solutions. After deciding for one of them, he selects the round icon and drags it into the drop spot.



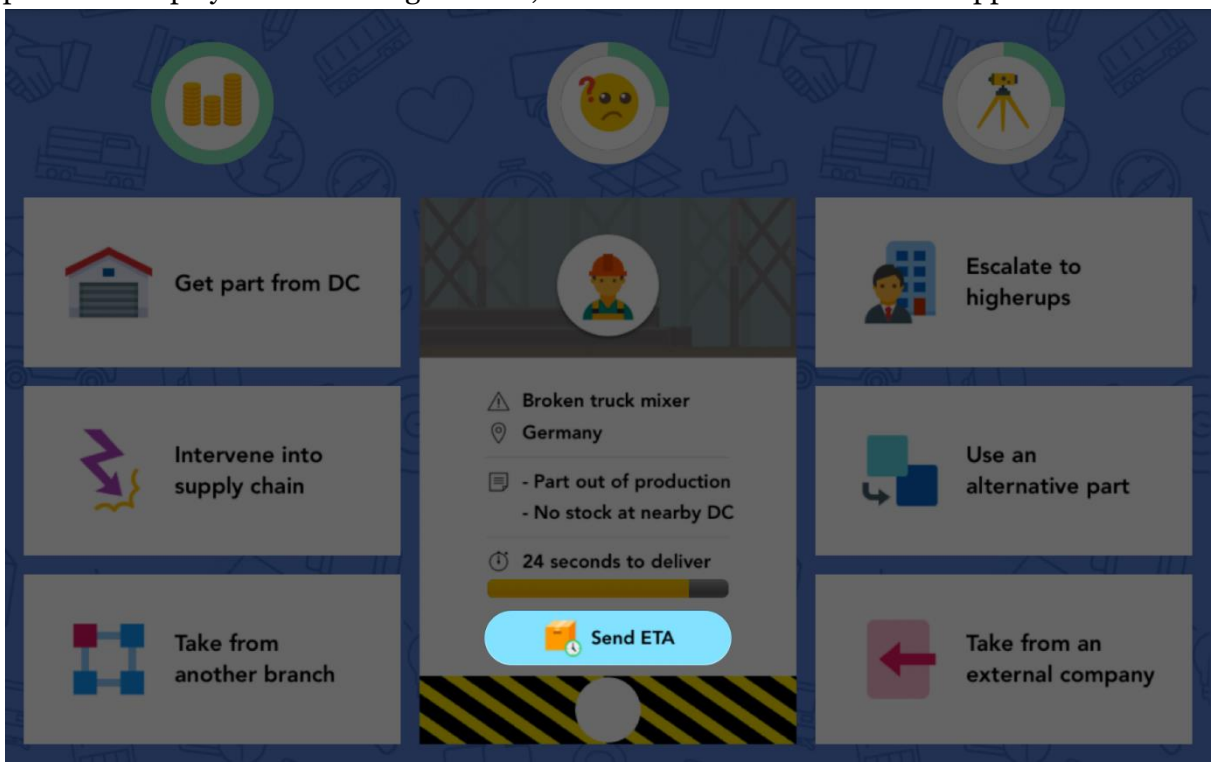
Step 3: The player gets feedback in form of scores and customer feedback.

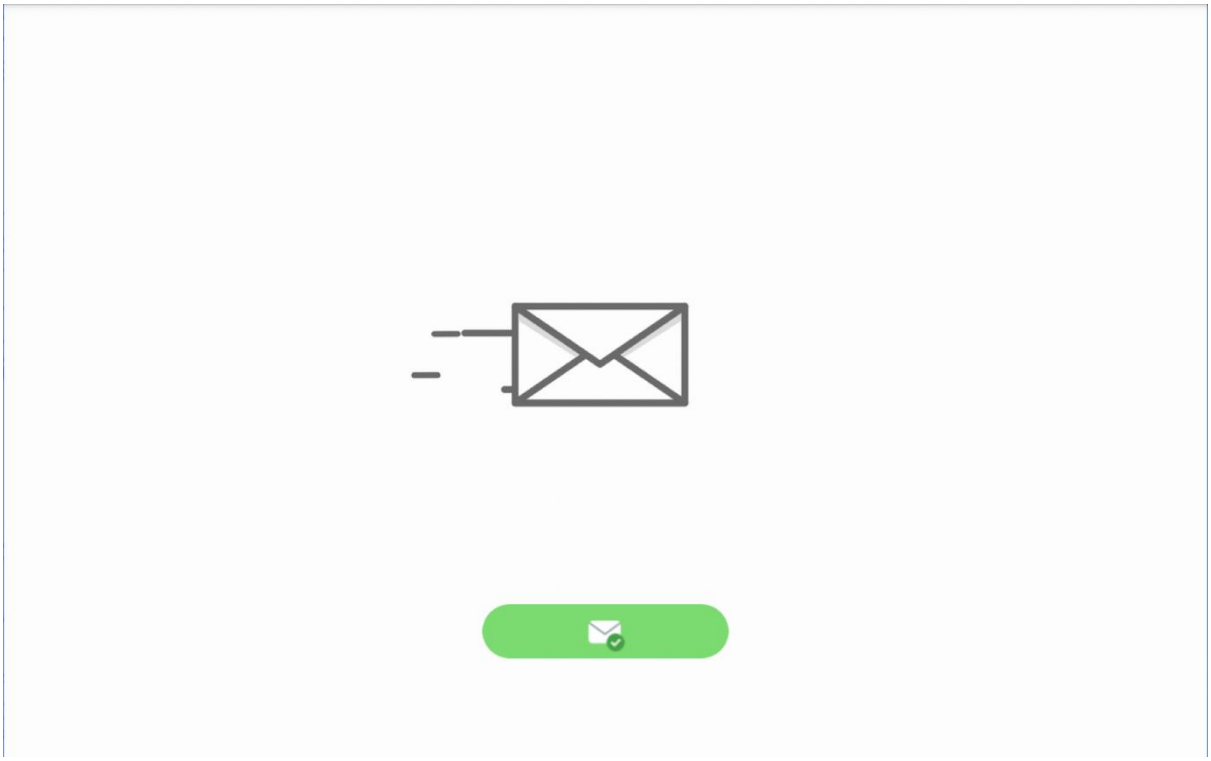


Step 4: The player gets presented with a new order and repeats the steps to solve it. However, it may possible that a selected solution is not available for that specific order. In that case, the game gives the user a feedback and another solution has to be selected.



Step 5: During each order the player can trigger the “Send ETA” button, which momentarily prevents the player from solving the case, but will increase the customer happiness.





Step 6: After the last order has been solved, the player is presented with an overall score and afterwards with a detailed breakdown of the score and some statistics.