



HERZBERG'S MOTIVATIONAL FACTORS IN A GAMIFICATION ENVIRONMENT

How motivational factors may be applied to game design in order to describe the experience of a serious game

Master Degree Project in Informatics
One year Level 22,5 ECTS
Spring term 2015

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Abstract

This paper is aimed to analyze how the Motivators in Herzberg's Two-Factor theory can be applied to a game design framework, namely the MDA-framework. This is done by evaluating a feature called Detailed Feedback System which is a gamification layer aimed towards evaluating photos from predetermined categories. The evaluation is done by letting participants use the Detailed Feedback System, and later letting them participate in an online survey on how it felt to use the feature. In this paper Self-Determination Theory and the Likert-scale is used in order to find a variance in their answers. This is later explored in a comparison matrix exploring which aspects of each theoretical framework may be the most prominent. The results are also analyzed to find variance in the final result, in order to find how significant the variance is in motivation and enjoyment, and why I conclude these findings to be positive.

Keywords: Motivation, MDA-framework, Herzberg, Game Design, Gamification.

Table of Contents

1	Introduction	1
2	Background	3
2.1	Ryan & Deci's Intrinsic and Extrinsic Motivation	3
2.1.1	Intrinsic Motivation	4
2.1.2	External Motivation	4
2.2	Herzberg's Two-Factor Theory	4
2.3	MDA-framework	5
2.4	Previous Research	6
2.4.1	Steinkuehler and Duncan (2008)	6
2.4.2	Mitgutsch (2009)	6
2.4.3	Conway (2010)	7
2.4.4	Ketelhut (2007)	7
3	The Detailed Feedback System	8
4	Problem	11
4.1	The MDA-framework and motivational theories	11
4.2	Method	13
4.2.1	Null Hypotheses	13
4.2.2	MDA-Analysis	14
4.2.3	Survey	15
4.2.4	Comparison Matrix	17
5	Results	19
5.1	MDA-Analysis of the Detailed Feedback System	19
5.2	Results from the Survey	19
6	Analysis	24
6.1	Comparison Matrix	24
6.2	Herzberg's Motivators	25
6.3	The MDA-framework	26
6.3.1	MDA-analysis	27
6.4	Herzberg's Motivators and the MDA-framework	27
7	Conclusion	29
7.1	Summary	29
7.2	Discussion	31
7.3	Future Work	34
	References	36

1 Introduction

The aim of this paper is to explore possible motivational factors that could be implemented in game design through the MDA-framework (Hunicke, LeBlanc, Zubek, 2004) by combining it with Herzberg's Two-Factor Theory (Herzberg, 1968). The aim of the work is to answer the question "In what way can Herzberg's Motivators be adapted to the MDA-framework?". This was done by using Herzberg's intrinsic factors from his Two-Factor Theory (Herzberg, 1968) as a supplement to the 8 Kinds of Fun found in the MDA-framework. In order to further explain motivation, in combination with definitions of intrinsic and extrinsic motivation was also used (Ryan & Deci, 2000a) to provide examples of how broad the field of motivation can be, and I am also for the purpose of this paper using it to limit myself to their definitions of motivation.

I also wrote this paper as a study in order to explore how game development for serious games and gamification might be improved by using one already existing framework, such as the MDA-framework, and a framework from a different field than game design, in this case Herzberg's Two-Factor Theory was chosen. Which is a framework that has been used in order to motivate employees on several different accounts. This paper aims to use a part of that framework, in this case as previously stated I used Herzberg's intrinsic factors. As gamification is a reoccurring concept, and a part of serious games it is shortly explained here. Gamification is the use of game design in non-game context, and can be seen as "games with a purpose", using game play to solve problems. As well as using video game and game aspects to shape user behavior, or instill embedded values (Deterding, 2011; Landers R. N., 2015; Landers R. N. & Landers A. K., 2015). The concept is influenced by macro-gameplay within video games: The objective-challenge-reward loop. Meaning that there is a task to accomplish, and afterwards reward or failure. (Fuchs, et al., 2015). Considering this reward loop, games can demonstrably motivate users with unparalleled intensity, games should be then able to make other products and services more enjoyable and engaging as well (Deterding, et al., 2011).

An online experiment was conducted where 44 participants used a system called The Detailed Feedback System (the gamification layer used in this paper), which helped them evaluate a set of photos. The system had predetermined categories which was used for the evaluation of said photos, the same categories was used for each photo. The participants could choose which of these categories corresponded to what they thought was good about the photo. After the participant had evaluated all photos, they were redirected to participate in an online survey where they was asked about how they felt when they evaluated the photos. The survey was based upon Self-Determination Theory, or SDT (Ryan & Deci, 2000b), and was measured by a Likert-scale (Likert, 1932) in this paper; a scale of 1-7, with different degrees of agreement. Whether or not the result was positive from the survey was based upon if a total score of the results were higher than a predetermined threshold of 4 (which is the middle of the scale), a negative result is based upon if their results was equal to a value in the lower part of the Likert-scale, which means anything below 4.

Before the data gathered from the survey was analyzed, the Detailed Feedback System was also analyzed to find in what way (according to the designers: A. Karavatos, R. Homewood, and R. Dahlberg) it was intended for the participants to feel when they used the system. This analysis was only based upon the factors from the MDA-framework. The data gathered from

the participants surveys were then analyzed by comparing the analysis from the MDA-analysis, and the participants answers. And also analyze if their motivational results were statistically significant. Both the data concerning the MDA-framework and Herzberg's Motivators was then analyzed for variance with One-Way ANOVA, and Repeated measures ANOVA in order to find statistical significant variance between the answers.

2 Background

The first part of this chapter covers the concept of motivation starting with Ryan and Deci (2000a), how motivation is not just a binary force of nature which either exists or not, how the environment and your own interests may affect your motivation. Following this, the second theory covering motivation in this chapter presents how motivation may be placed into a work environment according to Herzberg (1968), and how different kinds of factors within the environment and one's own interest may affect the level of motivation. The last part of this chapter covers how the MDA-framework (2004) functions, it will explain how the areas of the framework affects a game environment when designing a game, and how these effect in turn are supposed affect the end-users experience of the game.

2.1 Ryan & Deci's Intrinsic and Extrinsic Motivation

Ryan and Deci (2000a) revisit the definitions of intrinsic and extrinsic motivation. They explain what it means to be motivated, according to Ryan and Deci it is "to be moved" in order to do something, someone being energized or activated towards and end is considered to be motivated. Someone who feels no inspiration or impetus to act would be considered unmotivated.

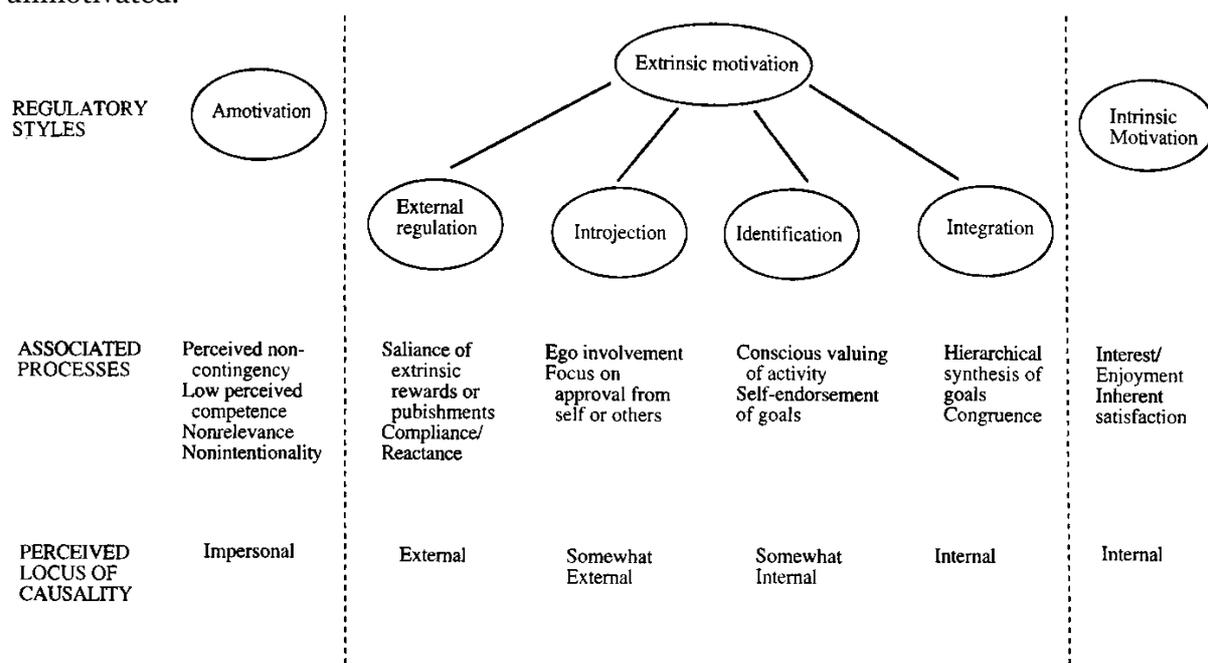


Figure 1 The table shows how Ryan and Deci describes the different variations of motivation, and how these may not be as binary as one might think. The two following paragraphs will explain these further.

Ryan and Deci also states that motivation may not be viewed as a unitary phenomenon, considering that people seem to not only have different amounts, but also different kinds of motivation. They argue that there is not only different levels of motivation but also orientation of motivation. This is something Ryan and Deci been distinguishing the different types of motivation and the different kinds of goals and reasons given for rising to a certain action. They point out that the most basic distinguishment within motivation would be Intrinsic Motivation and Extrinsic Motivation. Figure 1 shows the range of motivation which Ryan and Deci explains in their article, as can be seen it ranges from variations of extrinsic

motivation, towards intrinsic motivation. The figure also shows amotivation, which would be the nonexistence of motivation.

2.1.1 Intrinsic Motivation

According to Ryan and Deci (Ryan & Deci, 2000a), intrinsic motivation is defined by doing an activity which is satisfactory to the person's own self, rather than working for a separable consequence. When an intrinsically motivated person is moved to do something it would act for the fun or the challenge in the task itself, rather than doing the task because of an external pressure, reward or pressure. The authors also point out that intrinsic motivation was first acknowledged within experimental studies, the studies discovered that many organisms seemed to be engaged in exploratory, playful and curiosity-driven behaviors without any external reinforcement or rewards. These behaviors did seem to be done for positive experiences associated with exercising and extending one's capacities. They also point towards how a similar behavior can be found in humans in their early years as well, how they in their healthiest state, active, inquisitive, curious and playful, displaying readiness to learn and explore. As Ryan and Deci previously states, the intrinsic motivation of an individual does seem to have an individual orientation, as well as not having a specific orientation at all.

2.1.2 External Motivation

In contrast with Intrinsic Motivation, Ryan and Deci (Ryan & Deci, 2000a) explains that External Motivation would make a person moved to do a certain task to attain some sort of separable outcome, which would not necessarily include enjoyment in the task, but rather to attain a reward, or avoid punishment. The authors exemplifies this with two different cases. The first one with a student who does homework only because of the fear of the parents possible punishments, which would be considered to be an external motivation, because the student only does the homework to attain the separable outcome of avoiding punishment. However, a contrasting example would be a student who does the homework for a reward. A similar example would according to Ryan and Deci be a student that does the homework because the student believes it to lead to a desirable career of the student's choosing, which also would be a form of extrinsic motivation, considering that the student does the homework for the future reward, rather than finding the work interesting. Both examples shows examples of external motivation, the former showing compliance with external control while the latter shows external motivation by personal endorsement and a feeling of choice. However, according to Ryan and Deci, they both vary in their relative autonomy.

2.2 Herzberg's Two-Factor Theory

The Two-Factor Theory or Motivation-Hygiene Theory (Herzberg, 1968) is a theory about intrinsic and extrinsic motivation applied to a work environment, and of which factors in a work environment is considered to create satisfaction (motivation) in order to strive for better performance, and prevent dissatisfaction in the environment. Herzberg came to name factors which enhanced and increased the work satisfaction for "motivators", considering that they motivate the employee to enhance their performance. The factors relating to dissatisfaction came to be called "hygiene factors", considering that they covered the work environment. This means that the motivators aim to create satisfaction and motivation when they exist, but not dissatisfaction if they are not present. It also means that the presence of hygiene factors prevents dissatisfaction, but they do not necessarily create satisfaction. An

example with hygiene factors would be that good work conditions would not necessarily create satisfaction, but bad work conditions would create dissatisfaction. An example with motivators would be that interesting and challenging tasks would create satisfaction, but the absence of them would not create dissatisfaction.

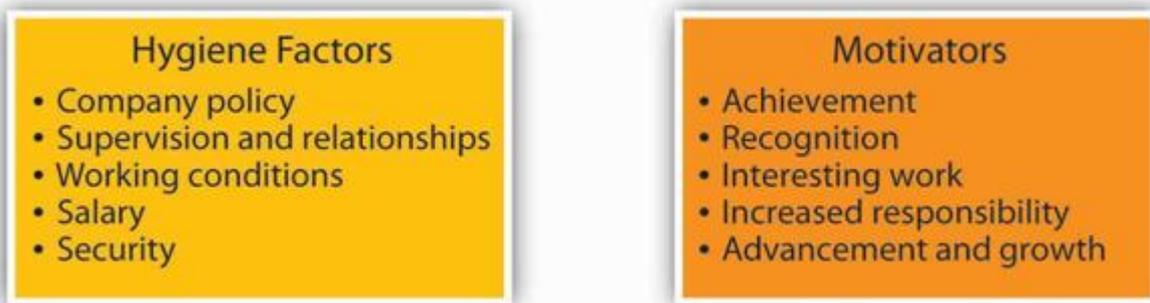


Figure 2 This figure shows a list of the factors in Herzberg's Two-Factor Theory.

Even though a complete analysis of The Detailed Feedback System according to Herzberg's Two-Factor Theory could be very interesting to make, I personally think it could be far too extensive considering it probably would require quite a lot of different kinds of tests and surveys in order to create such an analysis. I will in this paper focus upon the Motivators for the simple reason that this paper is analyzing in what way The Detailed Feedback System may motivate the participants in the experiment. The two different parts of the framework can be seen in figure 2, the hygiene factors to the left, and the motivators to the right.

2.3 MDA-framework

The MDA-framework stands for mechanics, dynamics and aesthetics. This is a framework created by Hunicke, LeBlanc and Zubek (2004) in order to understand how games work and how to create a bridge between game design and game development, but also a bridge between game designer and player, among others. The figure below describes how the designer reaches the player through mechanics, dynamics and aesthetics, while the player experiences the mechanics and dynamics from first being introduced to the aesthetics of the game.

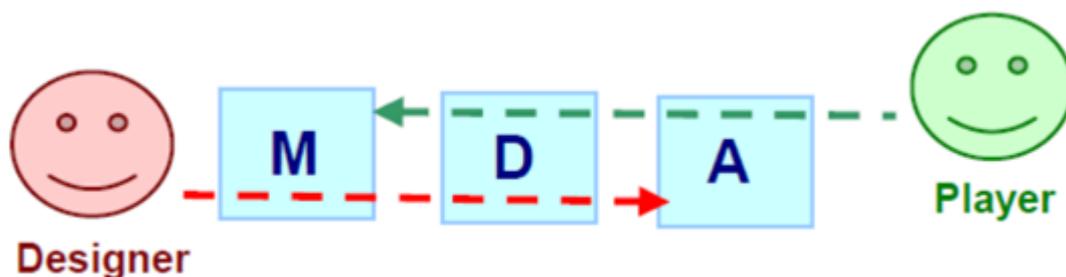


Figure 3 This figure shows the mechanics, dynamics and aesthetics perspective of a Designer which reaches the Player. It also shows how the Player perceives it in the opposite direction (aesthetics, dynamics, mechanics).

Mechanics are the most basic components within the game, which are the rules the game plays by, an example would be the use of shuffling, folding and calling in a game of Poker, or the different rules of movement in Chess. Dynamics are an extension of what mechanics can create, in both Chess and Poker the different mechanics can create bluffing dynamic. By

using both the examples of Poker and Chess which both allow the players to bluff, this can create the aesthetic Challenge. Aesthetics is in this case (game design) what kind of experience or fun the player should experience. Aesthetic can be broken into eight kinds of fun according to Hunicke et al. which are; Fantasy, Narrative, Challenge, Sensation, Expression, Fellowship, Submission and Discovery.

Gameplay are the challenges the player is presented with during the game and the actions the player is allowed to use during the game in order to overcome these challenges. This is something Adams (2010) refers to in *Fundamentals of Game Design*, The correct answer to the question, “Wouldn't it be fun to play a game set in ancient Rome?” is another question: “Yes, it would. What kinds of things could a player do in ancient Rome?” The more precise you are, the better. (Adams, 2010, p. 69). What Adams says in *Fundamentals of Game Design* not only correlates to how the aesthetics of the MDA-framework is an important part of the gameplay experience, but also the importance of what the player actually will be doing in the game, and give the player an understanding of what these things are, meaning that the dynamics and mechanics are at least equally important.

2.4 Previous Research

Here I present previous articles covering how different kinds of games move players in different ways. These articles seems suggest some sort of existing motivation within the games, that speaks to the users in a certain way, and inspired me to explore motivational measurement in game environments.

2.4.1 Steinkuehler and Duncan (2008)

Steinkuehler and Duncan (2008) wrote an article about how World of Warcraft (Blizzard, 2004) players seemed to show a scientific habit of mind in the World of Warcraft-forum, where the players discussed game play setups and tactics in order to increase their performance in the game. They did this by analyzing one particular part of the forum concerning a particular kind of character in the game, this was done because of the massive size of the forum as a whole. Steinkuehler and Duncan found that the community engaged in productive forms of problem solving, which was not surprising, it was on the other hand the overwhelming majority of 86% (Steinkuehler & Duncan, 2008, p. 541) of their conversations was dedicated to that goal. As the forum is a social environment of peers, that fosters to a genuine, open debate of complex, unanswered questions. As the designers of these virtual worlds can manipulate the dynamics in the game, creating a struggle for the player and thusly creating something to converse in order to find the most appropriate configuration. What Steinkuehler and Duncan means is that there exists a challenge, and the search for an answer for this challenge is a learning aspect in itself, and the forum being the appropriate location in order to search for the answers. Which can be seen as a construction of motivation within the game that speaks to these users, and the interesting question would be in what way they are motivated by this.

2.4.2 Mitgutsch (2009)

Mitgutsch (2009) covers the subject of learning through experiences, passion, anticipations, and prejudgments, as opposed to only logical, rational and linear learning processes. As an

example he writes about a game called *Shadow of the Colossus* (Sony, 2006), where the player has been given a set of goals from an godlike entity in order to save his love from death, these goals are to defeat a number of colossi inhabiting the world. A part from this the player will not receive any more rewards from the game but rather experience to aim for this goal, to explore the world, to be alone, and how it feels to defeat these colossi. By this Mitgutsch argues that learning is more than achieving enriched content, but also involves processes of experiences. This could be done by encouraging challenging concepts for experiences and problems, rather than relying on already existing games which have been played a hundred times. A way that challenges our experiences to their limit.

2.4.3 Conway (2010)

Conway (2010) wrote in his article how different extremes of ludicity may stimulate a player in different ways; contra-ludicity and hyper-ludicity. He uses different genres as examples in his article, as role-playing games, sports games, puzzle games and more. Where the base idea is how restricting (contra-ludicity) a player in a game may be beneficial for their stimulation, in order to increase challenge by limiting resources and time in the game, or how increasing (hyper-ludicity) the players freedom may be beneficial for their stimulation, in order to let the player become more free in the game and feel more powerful in it. He also states that both extremes may also interrupt the players immersion and flow, as contra-ludicity may frustrate the player with too challenging circumstances, while hyper-ludicity may bore the player because there is no suitable challenge present.

2.4.4 Ketelhut (2007)

In a study by Ketelhut (2007), where 100 seventh-grade students were investigated in their data-gathering behaviors in virtual world called *River City*. It could be seen how the interaction with a different environment changed the original behavior of the students. They got to play a game where students were to solve what caused an epidemic in *River City* by exercising different scientific-inquiry skills, as data gathering, interviews, and researching in previous records of the events in this virtual world. During the experiment, they could visit *River City* six times, for the duration of 10 days. The students were measured in their self-efficacy in scientific inquiry in the classroom, before visiting *River-City*, and were then measured in their self-efficacy three times during their visit to *River City*, in order to find whether or not the use of a virtual world had an impact on their self-efficacy. The students progress in their inquiry skills were also measured during their visit to *River City*, as in how often they interacted with the world. Ketelhut found that the students increased in their scientific data-gathering behaviors by nearly two behaviors on each visit (Ketelhut, 2007, p. 108), while their self-efficacy were not notably changed. However, she states that it was hard to determine whether or not this change in self-efficacy was caused by the students self-efficacy in scientific inquiry skills, or caused by their self-efficacy in computer interaction skills. As Ketelhut seems to suggest there might be a difference between the self-efficacy of the two skills, but there has however been a change in their behavior when looking at their data-gathering behavior. Which is my point of interest in her work.

3 The Detailed Feedback System

The Detailed Feedback System is a gamification feature that was developed as an assignment at the University of Skövde during the fall of 2014, by Athanasios Karavatos, Rob Homewood, and Rikard Dahlberg. It was implemented on a social community network aimed to photographers during the winter of same year. The aim with the Detailed Feedback System was to make it easier for photographers to give and receive positive feedback on their work. When the product was presented to the company, it was well received as well as the user base, we also got to know that it was used very often as well. However, I do retrospectively believe that this implementation might be able to be tested further in order to find in what way it affects the users.

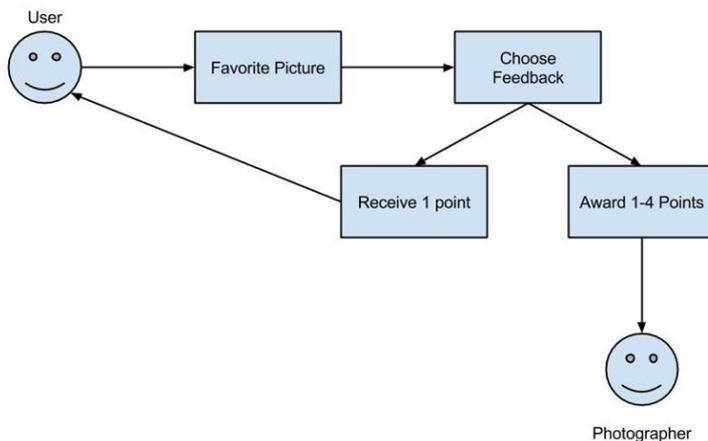


Figure 4 The user favorites a picture, and chooses what kind of feedback suits the photo. This earns the user 1 point. Depending on how many categories the user chooses, the photographer receives that many points.

As the figure above shows, balancing reward systems can appear to be very simple when they act in an isolated environment without a multitude of interactions, they can appear to be easily exploitable and unfair to the users. In this reward system, we tried to avoid creating a system which was easy for the user to exploit in order to collect points. This figure shows how the user will give feedback on a photo, and for that, the user receives 1 point. The photographer however will receive 1-4 points, depending on what the original user gave as feedback.

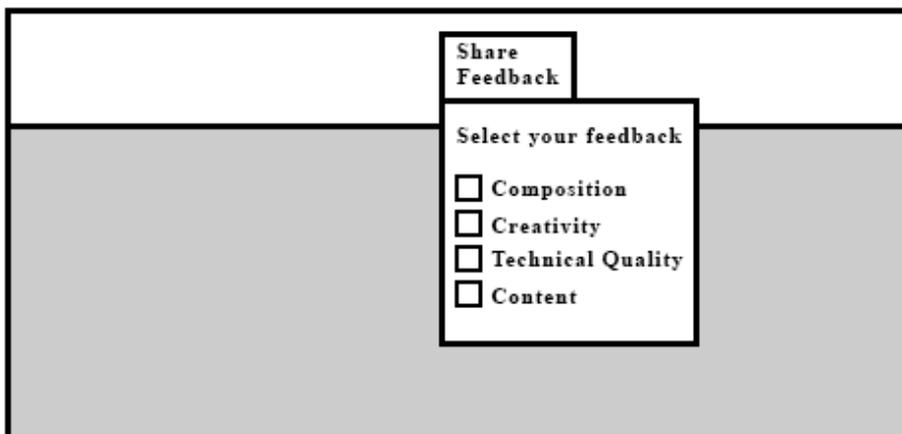


Figure 5 This is a rough mock-up of how the basic design of the feedback list would look like on the site. The gray area of the picture is where the photo is supposed to be, and the white bar above it is where different kind of social media links may be placed b

During the development, we also felt that it was important to try and keep the design simple for the user, without too many menus and not having to leave the same page in order to adjust something. This figure shows the drop-down menu which the user can easily access during the evaluation of the photos. The detailed feedback is constructed in such a way where the main goal is easy to use and allowing the users to communicate the relevant feedback of a particular photography, these are grouped in four different categories which are the following: Technical Specifications, Composition, Content and Creativity.

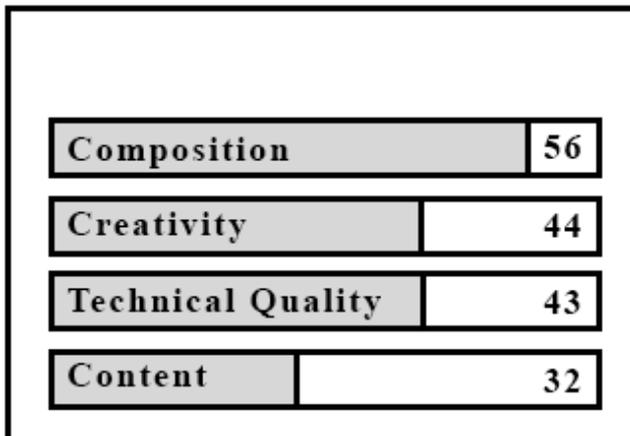


Figure 6 This picture shows how the scoring system will be presented to the user, the gray area is how much of the bar is filled as a visual impact for the user. And the numbers shows how high the photos score is in each category.

In order to keep the design simple and let the user have the relevant information easy at hand, as the figure above shows. A summary of the total score for each photo was also implemented. This information were to update live for the user as they gave the feedback.

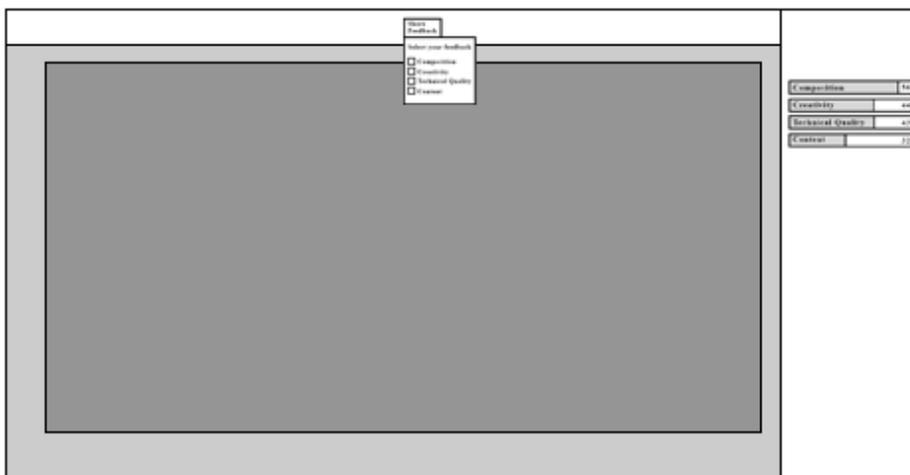


Figure 7 The pictures shows how the Detailed Feedback System is represented as a whole for the user, it shows how the list of categories does not interfere too much with the area of the photo (darkest gray), and shows a sidebar on the right where the score is showing.

It was important to not let the design of the system interfere with the rest of the features, considering that the main focus for the user was the photo, it was decided to try and keep the interference at the minimum. As the figure shows, the only real interference of the photo is the drop down menu which the user only can show when they let their cursor hover over it.

When my colleagues and I worked on this project we had few directions in what the company wanted to achieve with the gamification. One of these was that they wanted higher retention, meaning that they wanted the users to always come back and use the feature, and they also wanted the users to be able to learn from the feature. This also raises some questions that needs to be answered. In order to use the same feature several times, there has to be some sort of motivations to do so, as to fulfill some sort of need. Both Ryan and Deci (2000a), and Herzberg (1968) points this out when they talk about intrinsic and extrinsic motivation, there needs to be some sort of internal or external force which makes them move. Which leads to the following question: In what way would giving feedback according to already specified parameters be motivating for a user?

4 Problem

In this chapter present the problem of designing a game when there are certain parameters that needs to be met, such as retention or motivating a user, or creating a gamified feature for such purposes. With the main question whether or not motivational factors can be used in order to measure an experience in a game, which leads to a question that includes Herzberg's Motivators and the MDA-framework:

- In what way can Herzberg's Motivators be adapted to the MDA-framework?

Which means that Herzberg's Motivators should be able to contribute with experiences that the MDA-framework may not in its current state. However, this question is very vague can only represent the environment that is tested in this experiment. In addition to this, two more specific questions are added. Because of the broad nature of the main question, the two following questions was aimed to help me expand in what way Herzberg's Motivators may be adapted to the MDA-framework.

- How can Herzberg's motivators be used to analyze user experience when combined with thte MDA-framework?
- What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?

As the aim of this paper is to explore whether or not Herzberg's Motivators can be adapted to the MDA-framework, these two questions adds some measurability to the data. The first question "How can Herzberg's Motivators be used to analyze user experience when combined with thte MDA-framework?" will be answered whether or not there can be found a difference in data concerning Herzberg's Motivators compared to the MDA-framework. The second question "What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?" can be answered after an analysis is made and means from the data is found.

4.1 The MDA-framework and motivational theories

As Herzberg's Two-Factor Theory (1968), as well as Ryan and Deci (2000a) both seem to point to is how there are some certain basic needs that needs to be fulfilled in an learning or working environment in order to reach optimal performance from a person. Herzberg's Two-Factor Theory seem to argue that there is a difference between the extrinsic needs (ex. rewards, security) and intrinsic needs (ex. recognition, esteem), which needs to be fulfilled in order to reach the optimal performance and motivation for learning or working. This is also something that Ryan and Deci (2000a) points out in their work, showing the importance of the non-binary nature of intrinsic motivation compared to extrinsic motivation. The MDA-framework (2004) shows a quite simple way for a person to design a concept for a game, where it focuses on iterations between mechanics, dynamics and aesthetics, with a focus of keeping the theme of the game consistent. It doesn't however show how a game could adapt between different aesthetics which could be very good to cater to if it were to be used by game based learner, where learners might have different needs, either by skill level, attention, visual feedback or recognition for their progress. The MDA-framework seem to lack the aspects of Herzberg's Two-Factor Theory, but is on the other hand more focused on the correlation between the behavior of a design and the feeling it is

supposed to give a player. Can the MDA-framework be able to be reworked in order to adapt to motivational factors, in order to enhance game-play for learning? Considering that Herzberg's Two-Factor Theory is constructed in a way of preventing dissatisfaction, and creating satisfaction (or motivation), it may be a good starting point to explore if this is a possibility.

Considering that the Herzberg's Two-Factor Theory and the MDA-framework seems to follow different layouts in their informational structure, it may be hard to wrap the mind around how to adapt the MDA-framework to Herzberg's Two-Factor Theory, or how to modify the Two-Factor Theory with the use of the MDA-framework. The following figure will try to illustrate how it may be able to look like if it is possible.

Herzberg's Two-Factor Theory			
Hygiene Factors Company Policy Supervision and relationships Working conditions Salary Security	Motivators Achievement Recognition Interesting work Increased responsibility Advancement and Growth		
Herzberg's Two-Factor Theory with MDA influences			
Hygiene Factors Game Rules Supervision and relationships Flow under certain conditions Score or High Score Security	Motivators Achievement Recognition Interesting work Increased responsibility Advancement and Growth		
MDA-framework with Herzberg in-			
fluences	Mechanics	Dynamics	Aesthetics
	Creating intelligible game rules that covers Herzberg's Hygiene Factors. Ex. Salary, Security and Working Conditions.	Using the mechanics to foster behaviors in the game which could increase responsibility, advancement and growth.	Creating an immersive feeling through the dynamics which enhances the feeling of achievement and recognition.

Figure 8 The figures shows how different versions of Herzberg's Two-Factor Theory might look like. The upper example is the original Two-Factor Theory. The middle one is an example of how it might look like with game design terminology trying to replace some of

Considering that Herzberg's Two-Factor Theory have a factor that concerns the structure of the environment (Hygiene factors), and how these components are directly connected to a work environment, it can be easily seen that it is very hard to make tangible counterparts to game design. This raises questions as what "Company Policy" would be in a game environment, or "Supervisions and relationships", or "Salary" which might be tangible to "Scores" or "Rewards". As they are according to Herzberg extrinsic, and may vary depending on the environment. The Motivator Factors however are according to Herzberg intrinsic, and more easily adaptable to other environments than just work environments. Keeping this in mind, I will for this experiment focus upon whether or not Herzberg's Motivators can be adapted to the MDA-framework. Which also can be seen as an example in the last cell of figure 5, where the motivators interact with the dynamics and the aesthetics of the MDA-framework.

4.2 Method

The aim of this paper was to answer the question "In what way can Herzberg's Motivators be adapted to the MDA-framework?", as well as how to use the information in order to further ease the development of serious games. To do this an analysis of the MDA-framework was performed to the Detailed Feedback System, in order to find what intended experiences were for the end user. There were also needs to a measurement of what the participants experienced from the MDA-framework, as well as from Herzberg's Motivators. Considering that the aim also was to find whether or not Herzberg's Motivators were adaptable or existed among the participants, there also needed to be a measurement of this. As the survey for this paper was be used to collect the necessary data (which I use to base my analysis on), the statements regarding Herzberg's Motivators and the MDA-framework were was measured with a Likert-scale, ranging from 1 to 7, were 1 means that the participant strongly disagrees, and 7 means that the participant strongly agrees. This gave the participants the choice of different degrees of agreement to a variety of statements concerning their experience with the Detailed Feedback System. The analysis that was done used a confidence level of 0.05.

4.2.1 Null Hypotheses

In order to find whether or not the participants experienced motivation, the expectation was that the result of the data had some sort of statistical variance. A null hypothesis for each framework (Herzberg's Motivators, and the MDA-framework) helped answering the question "In what way can Herzberg's Motivators be adapted to the MDA-framework?". As this question was too broad it needed to be narrowed down into two questions. That could help me describe in what way Herzberg's Motivators may be adapted to the MDA-framework.

- How can Herzberg's Motivators be used to analyze user experience when combined with thte MDA-framework?
- What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?

These two questions was expected to be able to be answered by analyzing the data from the survey for variance, as Hypothesis 1, and Hypothesis 2 shows below.

Hypothesis 1:

- H_01 : There is no statistical variance among Herzberg's Motivators.
- H_a1 : There is statistical variance among Herzberg's Motivators.

An ANOVA-test was conducted in order to verify whether an variance between the motivators exists or not. If an variance existed the null hypothesis could be rejected, which also should indicate that the result of one or more of the motivators were considerably higher compared to the rest. This would mean that the participants experienced some sort of motivation when they used the Detailed Feedback System. If there were no variance in among the factors, this could mean that the participants did not experience any motivation at all, or that the results were to similar, which would result in failing to reject the null hypothesis. Meaning that if there were no variance in the data How can Herzberg's motivators be used to analyze user experience when combined with thte MDA-framework?, and there are no levels of significant motivation that can be concluded from the data.

Hypothesis 2:

- H_{02} : There is no statistical variance among the kinds of fun in the MDA-framework.
- H_{a2} : There is statistical variance among the kinds of fun in the MDA-framework.

An ANOVA-test was also to be conducted within the MDA-framework in order to verify whether an variance between the different kinds of fun existed or not. If an variance existed among the different kinds of fun, the null hypothesis could be rejected, which would indicate that some sort of enjoyment within the MDA-framework received a considerably higher score compared to the rest of the factors. Which would mean that the participants experienced some level of fun. If there were no variance among the different kinds of fun, this could mean that the participants did not experience any fun , or that the results from the survey were to similar and the data was inconclusive, which would result in failing to reject the null hypothesis.

In addition to the mentioned analyzes, a third ANOVA was conducted with the aim to compare the results from the highest mean from Herzberg's Motivator with the highest mean from the MDA-framework, including expected factors that may predicted in the MDA-analysis of the Detailed Feedback System.

4.2.2 MDA-Analysis

The first step in order to create both the survey and the comparison matrix was to use the MDA-framework in order to analyze the gamification. The aim for the MDA-analysis was to extrapolate what kinds of mechanics were used in the system, how they behaved dynamically with each other and what kind of aesthetics they created.

- **Mechanics:** The often most basic actions a player can do during a game which are included in the rules for the game. These actions can vary from walking, jumping, shooting, taking damage collecting items, interacting in dialogues, and even more simply as voting. This can be done by analyzing my previous work, when the group I worked together with constructed the gamification layer.
- **Dynamics:** By analyzing how the mechanics are used in the gamification layer of the Detailed Feedback System, and how it "plays", with the aim to find different kinds of behaviors within the site. By having the dynamics, it will allow me to find the aesthetics as well.
- **Aesthetics:** As Hunicke, LeBlanc and Zubek (2004) states in their paper "MDA: A Formal Approach to Game Design and Game Research" there are at least eight different kinds of Aesthetics (or 8 Kinds of Fun as it is referred to in the paper) that can be used in order to describe what kind of fun a game tries to convey, which are; Challenge, Discovery, Expression, Fantasy, Fellowship, Narrative, Sensation, and Submission. This will be done by relying upon how the dynamics and dynamics interacts with the site and the main focus of the gamification layer.

4.2.3 Survey

The questions in the survey were based upon the two previously mentioned frameworks, the motivators from Herzberg's Two-Factor Theory, and the 8 kinds of fun from the MDA-framework. In order to allow variance in the measurement of the answers, I chose to state each factor as a statement that the participant can choose to agree or disagree with in various degree by using a 1-7 scale from the Likert-scale. This was also based upon SDT (Ryan & Deci, 2000b) which is suited for surveys where the goal is to evaluate the behaviors or feelings towards something, in this case what they felt by using the Detailed Feedback System.

The statements concerning Herzberg's Motivators was to be directly correlated to the components in the Motivator factor. These are some examples from the survey:

- This activity gives me a sense of achievement and a feeling of accomplishing something.
- This activity is challenging in a way that keeps it interesting.

The statements about the 8 Kinds of fun was also be directly correlated to the components in the MDA-framework, except for one which was submission. I decided to alter this and rename it to retention, this was because submission might sound like a negative phrase and result in unclear data. These are some examples from the survey:

- This activity gives me a sense of retention, that I really feel the need to go back and do the same things again and again.
- This activity gives me a sense of expression which allows me to express me in a way that matters to me

In order to allow for a bigger sample size as possible, I chose to create a website which sole purpose was to demonstrate a simple interaction with the Detailed Feedback System, the site worked as small experiment where the participant could test the Detailed Feedback System before participating in the survey. The participant would evaluate 10 different photos according to the categories in the Detailed Feedback (creativity, content, technical quality, composition). The participant were then to be linked to the survey after the last photo had been evaluated.

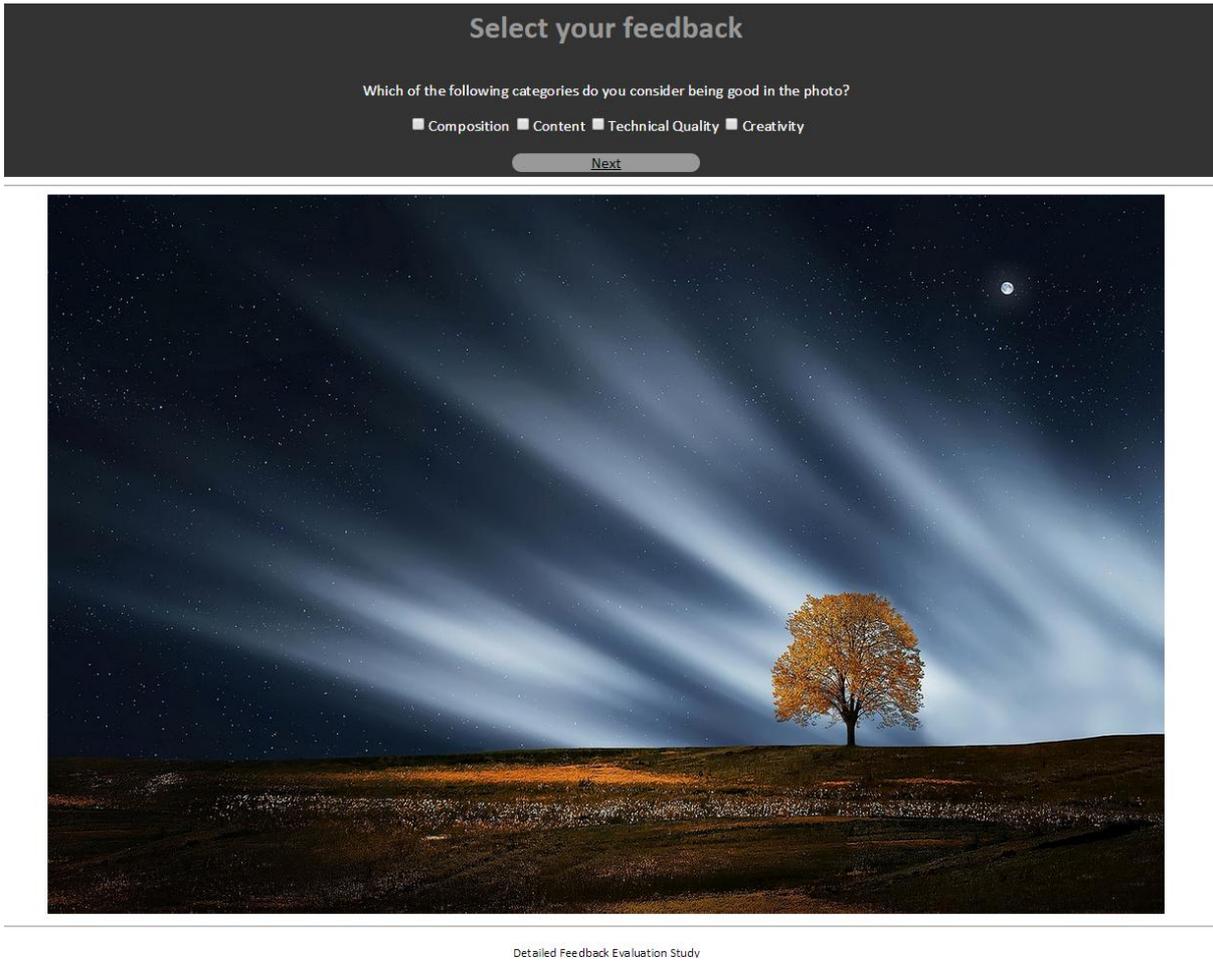


Figure 9 The picture shows how the experiment environment looks like, the participant selects any of the categories that they see fit, and clicks on "next" in order to proceed to the next photo. This is done until a link leads them to the survey.

It is also important to note that no data were collected concerning what the participants thought about the photos, the main reason for this decision was that it would require time to develop that on the site, and that this experiment did not aim towards evaluating the accuracy of the evaluation of the photos. The accuracy of evaluating could however be an interesting experiment, if you could measure the improvement of accuracy over time.

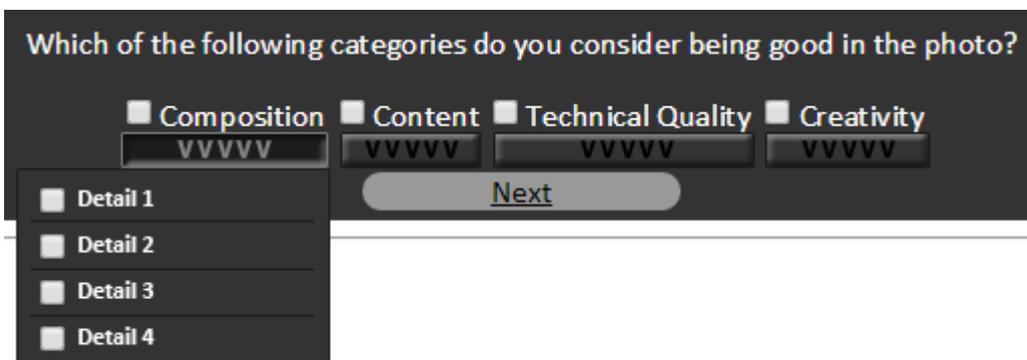


Figure 10 This picture shows a hypothetical addition to the Detailed Feedback System where the user can give more details about a category.

In addition to the questions regarding the MDA-framework and Herzberg's Two-Factor Theory, I also chose to include questions about the demographic, such as age and gender, how good they felt about themselves when it came to photography. I also gave them statements about if they enjoyed the Detailed Feedback System, if they would use it again, etc. During the last part of the test, I gave them statements whether or not they felt that the already existing categories felt too narrow, and free from questions of what kind of additional categories that might be useful in such an environment. Furthermore, I gave them two hypothetical alternatives of how they might want to give negative feedback as well.

Which of the following categories do you consider being good or needs improvement in the photo?

Good Composition Content Technical Quality Creativity

Needs Improvement Composition Content Technical Quality Creativity

Next

Figure 11 This picture shows a hypothetical addition to the Detailed Feedback System where the user can give negative feedback to the photographer.

The reason for the additional questions were to further investigate if the system seemed to be sufficient, or if the participant felt that there were more things that they wanted. They also received questions about what they would like to have in the system as well.

4.2.4 Comparison Matrix

Comparison Matrix	Challenge	Discovery	Expression	Fantasy	Fellowship	Narrative	Sensation	Submission
Achivement								
Challenge								
Growth								
Recognition								
Responsibility								

Figure 12 The comparison matrix with a column for the MDA-framework, and Herzberg's Motivators

The 8 kinds of fun from the MDA-framework and the motivational factors in Herzberg's Two-Factor Theory was then added together in a comparison matrix. This was done by creating two columns, one with the 8 kinds of fun, and the other with Herzberg's Motivators, which would allow the results to be represented as a adding table where a high score was a good result, the higher the better. Considering that each factor in both the MDA-framework and Herzberg's Two-Factor theory was to be measured with a Likert-scale from 1-7, the comparison matrix would also allow for variation between different factors, this would not answer my null hypotheses but rather helped me to get an overview of the data. As the comparison table would not deal with a mean of any result, but the sum total. The comparison table would also adjust the Likert-scale, and turn the middle of the scale into zero, this made the comparison matrix show the results in either a positive or negative value.

In order to show where I had put my threshold for a positive result, which is in the middle of the scale, I also subtracted 4 from the Likert-scale, which puts my threshold at zero on a scale from -3 to 3. This were however be done collectively after the result for each factor was added together. I did this by counting the numbers of participants, and multiply that by four, which resulted in a sum which later was used to adjust each factor with. It is also important to note that this was done two times, one for each set framework, considering that I compared two sets of data.

5 Results

5.1 MDA-Analysis of the Detailed Feedback System

Here I show the results of the MDA-analysis of the Detailed Feedback System.

- **Mechanic:** Click-to-Vote. Considering that the Detailed Feedback is a relatively non-complex gamification layer, there are not that many different mechanics which can exist in the that space. The Click-to-Vote mechanic is simple in that way that the user decides to click "Like" in order to show whether they like the picture or not, and then repeat a similar process by choosing why they liked the picture, by one or more of the following categories: Technical Quality, Composition, Creativity, or Content.
- **Dynamic:** Reviewing. In order for the user to decide whether or not the photography would be worthy of liking, and deciding what aspects of the photography the users likes, the user needs to review the picture and evaluate for themselves on why they like it.
- **Aesthetics:** The three main aesthetics for the Detailed Feedback is the following; Sensation, Expression, and Challenge. Sensation because the Detailed Feedbacks nature of presenting the user for different kinds of photographs during their visit, giving them the pleasure of visuals feedback in different degrees. Expression in the sense that the user can actively show the original author of the photograph what they think is good about the photograph, rather than just showing that they like the photograph in general. Challenge in the sense that the expressive freedom gives the user time to evaluate what they actually think of the photography, keeping in mind that the user will be faced with photographs of different quality all of the time which will make the user re-evaluate what they consider to be good in different photographs.

5.2 Results from the Survey

The survey consisted of a total of 44 participants which were able to participate in the experiment and in the survey online, the participants were also found on two different social communities which were facebook.com and reddit.com. I posted the survey in two different groups on facebook, one being a group for students in Skövde University, and one for students studying game design at Uppsala Universitet Campus Gotland. I also posted the survey on two different sub forums on reddit.com, one that was called "/r/samplesize" which only allows posts for surveys, and the other sub forum was called "/r/photocritique", which only allows posts for giving critique for photos. Considering that my study covers the subject of giving critique, it was allowed there. All of the posts that were made contained the same information, a short introduction of the system, and that they were to take the survey after they had tested the system. I also encouraged everyone to share the survey with anyone, and that it should contain the same instructions.

I start by presenting the mandatory questions of the survey which will help answer my question and null hypothesis, and questions describing the population, which covers the age demographic of the participants, how long they estimated their evaluation for each photo took. I present if the enjoyed the application, if they thought it had value to them, and most importantly in what way they experienced it with the statements based upon Herzberg's Motivators, and the MDA-framework. Later in the chapter I also present some optional questions from the survey, which covers if the participants thought the application was not broad enough, or needed to give options which explained what needs to be improved.

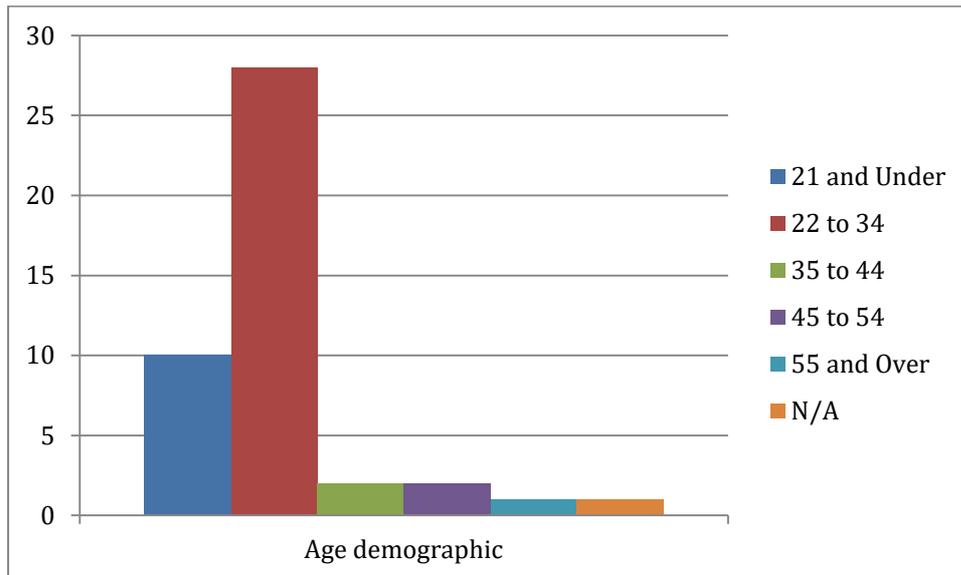


Figure 13 The age demographic of the participants

The participants were asked how old they were, figure 13 shows that 10 participants were 21 years or under, 27 were between 22 to 34, 2 were 35-44, 2 were 44-54, 1 were 55 or older, and 1 that did not want to share that information.

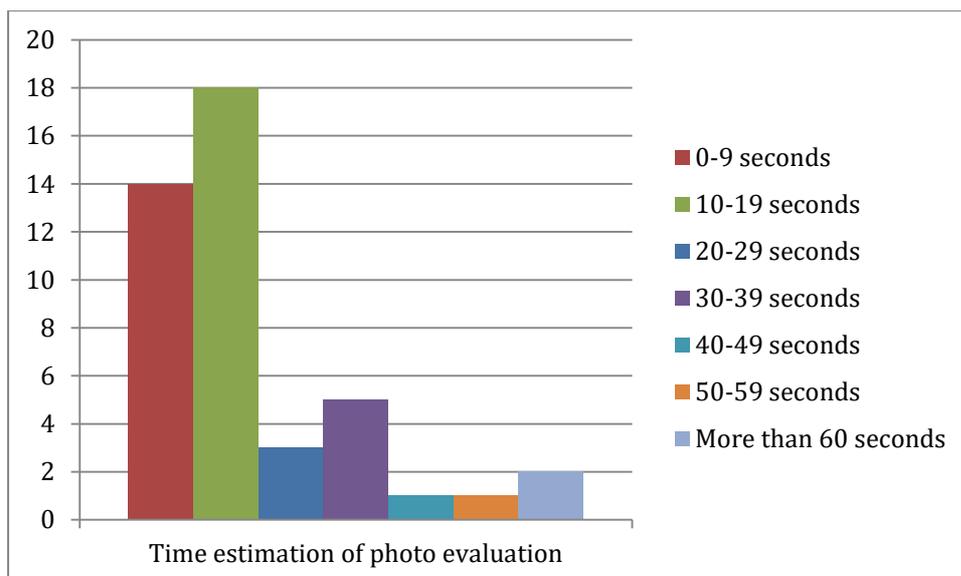


Figure 14 The estimated time each participant had to choose

The participants were given to estimate their time for evaluating one photo by increments of 10 seconds as can be seen in figure 14. It can be seen that the majority of the participants

took shorter time during their evaluation, 14 took 0-9 seconds, 18 took 10-19 seconds. 3 took 20-29, 5 took 30-39, 1 took 40-49, 1 took 50-59, and 2 60+ seconds.

The participants were given the statement "I enjoy reviewing other people's photos using the Detailed Feedback", 2 participants strongly agreed, 3 agreed, 13 somewhat agreed, 8 neither agreed or disagreed, 8 somewhat disagreed, 8 disagreed, and 2 strongly disagreed. In total 18 agreed, 18 disagreed, and 8 were undecided. The data from the suggests that there an overall inconclusiveness whether they enjoyed it or not.

To the question "I believe that using the Detailed Feedback is of some value to me" the data collected shows whether or not the participants agree or disagree whether or not the detailed feedback has of some value to them. 3 participants strongly agreed, 6 almost strongly agreed, 13 agreed, 6 neither agreed or disagreed, 7 somewhat disagreed, 7 disagreed, and 2 participants strongly disagreed. In total 21 agreed, 16 disagreed, and 6 were undecided. The data seems to show that the participants overall agree upon that it has some value. This data suggests that the participants agree that using the detailed feedback is of some value to them.

The participants were also asked "I would be willing to use the Detailed Feedback again because it has some value to me". The collected data suggests that the participants are willing to use it again because it had value to them. 4 participants strongly agreed, 8 agreed, 10 somewhat agreed, 6 neither agreed or disagreed, 5 somewhat disagreed, 7 disagreed, 4 strongly disagreed. In total 22 agreed, 16 disagreed, 6 were undecided.

In addition the participants were also presented with the statement "I believe that I can learn something about photography by reviewing others photos with the Detailed Feedback". To this statement 11 participants strongly agreed, 12 agreed, 7 somewhat agreed, 4 neither agreed or disagreed, 4 somewhat disagreed, 3 disagreed, 3 strongly disagreed. In total 30 participants agreed, 10 disagreed, 4 were undecided. The data suggests that the participants believed that the feature can teach them something about photography.

The participants were also asked "I believe that I can learn something about photography by reviewing others photos with the Detailed Feedback". To this 10 of the participants strongly agreed, 4 almost strongly agreed, 8 agreed, 10 neither agreed or disagreed, 5 disagreed, 6 almost strongly disagreed, 1 strongly disagreed. In total 22 agreed, 12 disagreed, 10 were undecided.



Figure 15 Data of what kind of enjoyment they felt when they using the feature

The participants were also asked in what way they enjoyed giving feedback on the site, this also has a total score of 308 (44*7). As can be seen the most prominent one is Sensation (222), followed by Discovery (171), Expression (166), challenge (160), Fantasy (155), Fellowship (132), Narrative (121), and lastly Submission (103).

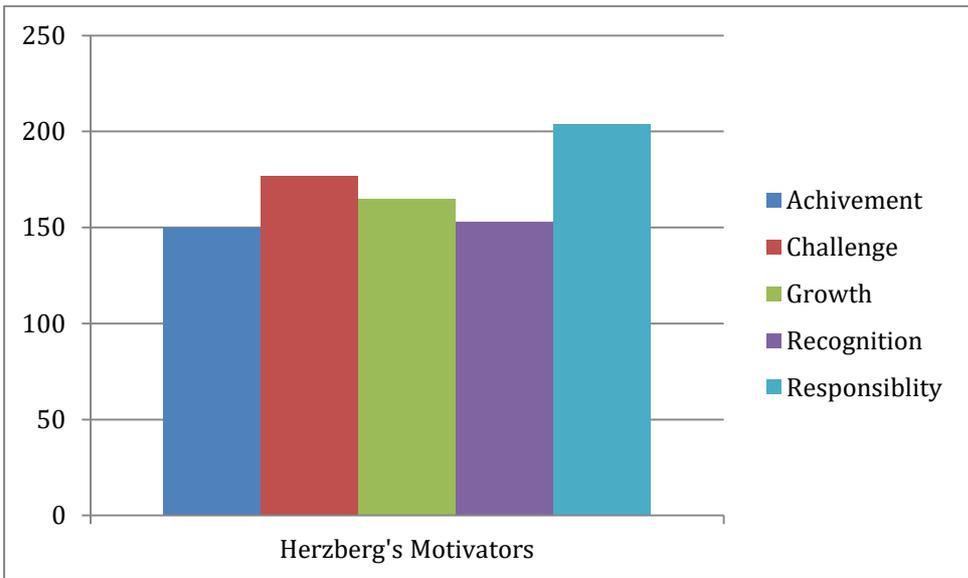


Figure 16 Data showing in what way the felt motivation when they used the feature

The participants were asked how much they agreed upon how they were motivated by evaluating the photos on the site. Considering that there were 44 participants, and 7 was the highest on the Likert-scale, the highest value is in this case 308. The data shows how Responsibility is the highest motivator (204), followed by Challenge (177), Growth (165), Recognition (153), and Achievement (150).

In addition to the mandatory questions of the survey, the participants were also asked voluntary questions of what might be improved in the Detailed Feedback System, the following two questions were asked

The participants were given the statement "I feel that the Detailed Feedback needs choices that cover what a photographer need to get better at" which related to figure 12. To this 7 of the participants strongly agreed, 9 agreed, 8 somewhat agreed, 6 neither agreed or disagreed, 4 somewhat disagreed, 5 disagreed, 1 strongly disagreed. In total 24 agreed, 10 disagreed, 6 were undecided. 40 of the participants answered this question.

They were also asked "Do you feel that the choices in the Detailed Feedback are too broad?" considering that 4 options might be too limiting, which related to figure 11. To this statement 4 of the participants strongly disagreed, 6 disagreed, 9 somewhat disagreed, 7 neither disagreed or agreed, 7 somewhat agreed, 6 agreed, 3 strongly agreed. In total, 19 disagreed, 7 neither disagreed or agreed, 16 agreed. 42 participants answered this question.

In addition to this, they were also given the statement " I feel that the Detailed Feedback makes me more are of why I like a photo". To this 5 participants strongly agreed, 12 almost strongly agreed, 9 agreed, 5 did neither agree or disagree, 4 disagreed, 2 almost strongly disagreed, and 3 strongly disagreed. In total 26 agreed, 9 disagreed, and 5 were undecided. 40 of the participants answered this question.

6 Analysis

Here I present the analysis of the data from the survey, focusing upon the questions regarding Herzberg's Motivators and the MDA-framework. Starting with illustrating how the different factors might be able to influence other factors with a comparison matrix. Which also gives an overall view of the data that was gathered.

I also present the analyzes of each framework, Herzberg's Motivators and the MDA-framework. And answering the main question "In what way can Herzberg's Motivators be adapted to the MDA-framework?", by starting with the two following questions "How can Herzberg's Motivators be used to analyze user experience when combined with thte MDA-framework?", and "What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?", as these questions helped me to answer the main question. It is important to remember that the Repeated Measures ANOVA was conducted with a confidence level of 0.05, and that any score above the mean of 4 is considered positive. However, depending on how much a factor has exceeded the mean of 4 it might be questionable if it is actually significantly different than the mean, which might raise the question whether or not to accept that factor as positive or not. This could be done analyzing its variance with the mean.

After the analysis of Herzberg's Motivators and the MDA-framework is presented, a third analysis is presented containing the highest scoring factors from the analysis of Herzberg's Motivators, and the highest scoring factors from the MDA-framework, as well as the predicted factors from the previous MDA-analysis.

6.1 Comparison Matrix

When combining the different factors, there was a risk that high scoring factors adjusts lower scoring factors, this can be seen in the factors of Responsibility and Sensation which seems to give an over positive result of enjoyment and motivation, in this case Sensation turns all of the motivators positive. These motivators needs to be compared to zero of the scale in order to find if they are statistically significant, which will be done further down in the ANOVA chapters. This data provides an oversight of combining the different factors with each other after they have been adjusted to a scale from -264 to 264, in order to easier observe how the factors might affect each other. To reach this I multiplied the middle of the Likert-scale with number of participants (4 multiplied by 44), which results in 176, which is the middle of the total score of the survey, the lowest score possible is 44, and the highest is 308. By subtracting 176 to any of the result it is adjusted to be either positive or negative depending on which side of the middle of the Likert-scale it is.

Table 1 The table shows how the adjusted values from the survey were added together in order to find which factors came to have a positive value.

Comparison Matrix	Challenge	Discovery	Expression	Fantasy	Fellowship	Narrative	Sensation	Submission
Achievement	-42	-31	-36	-87	-70	-81	20	-99
Challenge	-15	-4	-9	-60	-43	-54	47	-72
Growth	-27	-16	-21	-72	-55	-66	35	-84
Recognition	-39	-28	-33	-84	-67	-78	23	-96
Responsibility	12	23	18	-33	-16	-27	74	-45

It is important to note that table 1 shows the combined results of each factor, this can make it appear like the comparison matrix may give an idea that it has bad results overall. The main goal with the study was not to find if the participants could score each factor as high as possible. It was to find if it was possible to explore or find what kinds of motivators that could be experienced by the participants, and if they could be applied to the MDA-framework. Which means that an overall positive result in the matrix is not necessary, it should be easy to spot what is successful. In this case it can be seen that the Responsibility factor is very positively received, as well as the Sensation factor, however, the MDA-factors Challenge, Expression and Discovery are also of note. The matrix clearly shows that the Detailed Feedback System gives the participant a sense of responsibility, and sensation which they enjoy or intrinsically motivates them, as well as having so high scores that they adjust other factors when combined with them.

Even though the comparison matrix might give an idea of which of the factors may be significant, they needed to be analyzed for variance. First eliminating which of the motivators that were significantly different from each other, and identify which of the motivators are above the threshold. The same procedure needed to be done with the MDA-framework.

6.2 Herzberg's Motivators

Here I present the analysis of Herzberg's Motivators. It can be noted that two of the motivators are of interest here, which are Challenge and Responsibility. One that scored very high compared to the others, and one that just barely is over the threshold of being positive. I also once again present the null hypothesis that was in question.

- H_01 : There is no statistical variance among Herzberg's Motivators.
- H_a1 : There is statistical variance among Herzberg's Motivators.

Table 2 Means and Standard Deviation of Herzberg's Motivators

SUMMARY		
<i>Motivators</i>	<i>Mean</i>	<i>STD</i>
Achievement	3.4091	1.4835
Challenge	4.0227	1.6911
Growth	3.7500	1.4163
Responsibility	4.6364	1.7978
Recognition	3.4773	3.2320

This table shows how Responsibility was the most prominent significantly different factor among the motivators. Responsibility had the highest mean score of 4.64 (SD = 1.80), it also shows that Challenge received a score of 4.02 (SD = 1,70). Table 2 shows the mean scores and standard deviation for all Herzberg's Motivators. The difference between the scores was statistically significant ($F(4,172) = 8.70$, $MSE = 1.25$, $p = 0.0027$). As the confidence level for the Repeated Measures ANOVA was 0.05, and the p-value is 0.0027, the null hypothesis can be rejected, there is a variance among Herzberg's Motivators.

As to the question "What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?", it can be seen in table 2 that Responsibility offers the highest motivation level of 4.64, followed by Challenge at 4.02. While the rest of the factors has a mean below of the mean of 4.

6.3 The MDA-framework

As for Herzberg's Motivators, the factors in the MDA-framework also needed to be checked for variance and significance. It can be seen that four different factors are of note here, three of those are my predetermined factors from my MDA-analysis, and one is of note because it scored similarly to two of my predetermined factors. I also present the null-hypothesis that was in question.

- H_02 : There is no statistical variance among the kinds of fun in the MDA-framework.
- H_a2 : There is statistical variance among the kinds of fun in the MDA-framework.

Table 3 Means and Standard Deviations of the MDA-framework

SUMMARY		
<i>MDA-factors</i>	<i>Mean</i>	<i>STD</i>
Challenge	3.6364	1.7533
Discovery	3.8864	1.8200
Expression	3.7727	1.8026
Fantasy	2.6136	1.5880
Fellowship	3.000	1.7915
Narrative	2.7500	1.7537
Sensation	5.0455	1.7647
Submission	2.3409	1.2189

Table 3 shows two of chosen factors Challenge (Mean = 3.64, SD = 1.75) and Expression (Mean = 3.77, SD = 1.80) has received a score lower than the threshold mean of 4. While Sensation received a considerably higher mean score of 5.05 (SD = 1.77). It is also worth to note that Discovery (Mean = 3.89, SD = 1.82) has received a score similar to Challenge and Expression, which was unexpected. The difference between the scores of the MDA-framework was statistically different ($F(7,301) = 12.91$, $MSE = 2.66$, $p = 0.001$), as the p-value is lower than the confidence level of 0.05.

As can be seen in the table Sensation was the only factor in the MDA-framework that shows any positive result (a mean above 4) in a way of enjoyment in the Detailed Feedback System. The table also shows how Challenge and Expression received a mean just under 4, which

mean that the according to my previous threshold are not positive. However, Discovery which was a factor I did not include in the analysis have received a mean similar to Challenge and Expression.

It can also be seen in table 3 that it gives an answer the question "What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?" where Sensation has the highest mean of 5, while the rest of the factors are below the mean of 4.

6.3.1 MDA-analysis

Challenge, Expression and Sensation, was my targeted factors from my MDA-analysis. Two out of the targeted factors (Challenge and Expression) did not seem to have the impact as I intended on the participants, considering the scored that they received placed them below the mean of the scoring list. It is however interesting to see that they seem to be nested around the same area in the results (just below zero), along with Discovery, while the rest of the non-targeted factors received lower scores overall. Keeping in mind that the participants did not have many different choices to make in the experiment (the different choices for evaluating photos) this may be a leading cause of why they did not feel that they could express themselves properly, or enough. This can also be seen in the last part of the results of the survey. It was some of the critique received in the voluntary parts of the survey. I also believe that they might not have understood how it might have been challenging or expressive, due to the small environment that they were put into, with a lack of information.

6.4 Herzberg's Motivators and the MDA-framework

From the data I have collected from the survey, there were some mandatory factors that were going to be analyzed according to my analysis of the MDA-framework concerning the Detailed Feedback System, these were; Challenge, Expression and Sensation. And the motivator that came to produce the highest and most notable score which was Responsibility. In addition to this, I also chose to include Discovery in the analysis, this was because it scored very similar to Challenge and Expression. It is important to note that Challenge is from the MDA-framework. I also chose to exclude Challenge from Herzberg's Motivators because its ambiguity whether or not it was positive or not.

Table 4 Means and Standard Deviations of the remaining factors from Herzberg's Motivators, and the MDA-framework

SUMMARY		
<i>MDA and Motivators</i>	<i>Mean</i>	<i>STD</i>
Responsibility	4.6364	1.6295
Challenge	3.6364	1.7533
Discovery	3.8864	1.8200
Expression	3.7727	1.8026
Sensation	5.0455	1.7647

As can be seen in the table 4 there are two high mean scores, which are Responsibility 4.64 (SD = 1.63) and Sensation 5.05 (SD = 1.77). Meaning that the participants did enjoy the feeling of responsibility, and the feeling of sensation, but did not feel Challenge, Expression

and Discovery in the same extent. It can be seen that there is a significant difference ($F(4, 172) = 7.96$, $MSE = 2.08$, $p = 0.001$). This also gives an answer to the question "How can Herzberg's Motivators be used to analyze user experience when combined with the MDA-framework?" it can be seen that by combining the MDA-framework with Herzberg's Motivators both Responsibility and Sensation contributes with information of what the participants experienced during the experiment.

7 Conclusion

Here I present the conclusion of my findings of why Herzberg's Motivators can be adaptable or applied to the MDA-framework, as my main question was "In what way can Herzberg's Motivators be adapted to the MDA-framework?". I will also include why some factors were left out and why others were included in the final ANOVA. In addition to this, I also answer why Herzberg's Motivators contribute additional experiences when combined with the MDA-framework, as well as what motivation and enjoyment factors the both framework are perceived to important. As the two questions "How can Herzberg's Motivators be used to analyze user experience when combined with the MDA-framework?", and "What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?" are the ones measured with my null hypotheses.

Secondly I present how my work relates to my background and the definition of motivation I have used for this paper, which is Ryan and Deci, and Herzberg. As well as how it relates to the works of Mitgutsch, Conway, Ketelhut, and Steinkuehler and Duncan. And give examples on how these can be of further use to analyzing different games, and use this work or similar studies to further the research of serious games.

Later in the chapter I present what might need to be done as Herzberg's Two-Factory Theory seems to be compatible with the MDA-framework as in this study. Which includes the hardship of transposing the nomenclature of a working environment to a game environment, and why it is important in order to find the Hygiene factors. As well as how researching different motivational factors in conjunction with game design is important. I will also use this chapter to present what the findings can be used for, influenced by Herzberg's "One more time" and the MDA-framework as well. And how it might ease the research conducted when developing a serious game or gamification.

7.1 Summary

As the results shows to my main question "In what way can Herzberg's Motivators be adapted to the MDA-framework?", Herzberg's Motivators seems to be able to supplement the already existing kinds of fun in the MDA-framework, as additional Kinds of Fun. It can clearly be seen that 2 out of 13 factors received a higher score which also are statistically different from the rest of the data, which can be seen in tables 2 and 3, as both p-values for each table was below p-value of 0.05. It can also be seen in table 4 that their means are different, and the p-value was below 0.05. This also show that adding supplementary factors from other fields than game design gives participants a greater variety of choices in order to pinpoint how a gamification feature affects them. It is also important to add that these results only represents how the combination of these frameworks only describes the participants experiences of the Detailed Feedback System in this study. Which I would like to see as an encouragement to explore these frameworks (and others) in order to define how another game is experienced, considering that this study was made in a rather small environment with 44 participants, and with few mechanics that the participants could be affected by.

In order to support my main question "In what way can Herzberg's Motivators be adapted to the MDA-framework?", which I have concluded to that it in this case can. Two more questions were asked in order to support the main question. The first one was "How can

Herzberg's Motivators be used to analyze user experience when combined with the MDA-framework?". According to the data I have gathered and analyzed in this study, Herzberg's Motivators do contribute to additional experiences, as they give the participants experiences that are not described in the MDA-framework. It can also be seen in table 2, that one of factors received a higher mean (4.64) than the rest of Herzberg's Motivators, and as can be seen in table 3 that one of the factors in the MDA-framework received a higher mean as well (5.05). Both tables shows that each framework gives the participants options to describe their experiences when using the Detailed Feedback System

As the second question "What motivation and enjoyment factors are perceived to be important when using the combined Herzberg and MDA frameworks for evaluation?", it can be seen that there are two notable means in both frameworks, Responsibility (4.64) from Herzberg's Motivators (table 2), and Sensation (5.05) from the MDA-framework (table 3), which also are the only notable means from each framework that exceeds the mean of 4. Which means that the participants did in fact experienced some sort of responsibility when they used the Detailed Feedback System, as well as experiencing stimulation when they used the system.

In this case Herzberg's Motivators gave the participants the opportunity to chose on what level they experienced responsibility when they used the Detailed Feedback System, which was not possible with only the MDA-framework. The MDA-framework shows that being able to properly define in what way a game is fun is important, considering that the framework is aimed towards entertainment, being able to also properly define how a game is experienced in other ways than entertainment may also be good, considering that other goals than entertainment are coveted for serious games. As is shown in figure 3, the participants most notably enjoyed Sensation, meaning that they enjoyed the visual stimulation that the system gave them. The figure also shows how different kinds of fun were higher than others, such as Challenge, Discovery, and Expression, which suggests that these factors were experienced to some extent as well, but not as noticeable to some of the participant. I would suggest that these factors are important, because they may be able to improve the game environment for the sake of variety. This could be done adding ways for the participants to more widely express themselves, and it would be interesting to measure how this effects Expression and Challenge as well, considering that it could be more challenging to evaluate the photo with more option, as well as allowing the users to be more expressive. This could of course change the effect of Herzberg's Motivators, which also would be very interesting to analyze, whether or not changes in the MDA-framework affects Herzberg's Motivators. It was also interesting to explore how Challenge from Herzberg's Motivators and the MDA-framework came to score similarly MDA Challenge scored 3.64, and Herzberg Challenge scored 4.02. It was not my intention to use a duplicate of Challenge factor in a way of measure the accuracy of the participants scores, but they were used as they were from different frameworks. I did however chose to ignore Herzberg Challenge due to the small variance from the mean of 4, as it exceeded the mean of 0.02, this seemed to be very ambiguous to me. This does not mean that Herzberg's Challenge factor is not important, but I would like to consider it as fact that it is interesting result which needs to be analyzed further. It also shows that there is a need to further define the different factors, in order to allow for a more varied experience response.

In addition my analyzes show, analyzing and testing isolated game features can produce interesting results in a way that suggests what the participants experience in a certain feature, it also shows how it is important to measure against your own predefined

parameters and check these against the perceived parameters after the experiment. In this case, I have made an experiment on a small scale with a simple feature, this feature does however speak to the participant in a very certain way, despite its size or lacking of complexity of the feature. I do also believe that it is important to analyze a feature as far as possible in order to find the core aspects of the feature. This means that reward systems and features that are not directly related to the interaction of the feature to be removed, meaning that the features core structure only needs to be working. When this is done, adding more features to the core feature may be possible in order to analyze how the feature may change depending on what feature is implemented.

It is explained by Herzberg that his motivators are aimed towards a serious goal, such as motivating the employees in a working environment, in a more extended way than an increase of salary, and a ethical way than adding unnecessary stress to the employee. As in increasing the satisfaction for the employees. I would like to consider calling these Motivators for Serious Factors when it comes to describe the motivation experienced by the user, and make it more easily distinguishable from the 8 Kinds of Fun, which I would like to call Fun Factors. This means that it may be easier to know what kind of serious improvement that is aimed towards, and what kind of fun is aim for. This would however create a total of 13 total factors, 8 of these being Fun Factors, and 5 being Serious factors, it may also be needed to remove one of the challenge factors considering that they may be hard to distinguish from each other otherwise, unless they are differentiated by another naming convention and clearly distinguishable from each other. I also believe that each factor may contain more precise sub factors, such as in what way a participant feels a sensation whether it is emotional, visual, auditory, or in what way they might recognize the stimulation to the context. It may also be worth to once again note that Herzberg's Motivators are intrinsic motivators, and may not be needed to be used as comparing them against the 8 kinds of Fun, but rather to evaluate how well they can describe an experience.

I would like to note that there were no analyzes made to verify whether or not the different factors from each framework seemed to effect each other, or predict each other. An assumption could be made from figure 2 and figure 3, that Responsibility and Sensation is related in such a way because of their high scores. Because of this I will consider the Serious Factors (Herzberg's Motivators) an extension of the 8 Kinds of Fun from the MDA-framework which can be used in order to measure factors which does not exist in among the 8 Kinds of Fun. As my data shows in table 2 and 3, both of the frameworks measures different kinds of experiences and makes it possible to describe the applications purpose better.

7.2 Discussion

In Herzberg's Two-Factor Theory (1968), there is a clear distinction between intrinsic and extrinsic motivation. Herzberg describes the extrinsic motivation as Hygiene Factors which fills the purpose to prevent dissatisfaction, and intrinsic motivation as motivators which fills the purpose to increase satisfaction. This study has shown that at least one of Herzberg's Motivators can be found when using them as a measurement in order to describe an experience in an application. As can be seen in table 2, where Responsibility has received the highest mean compared to the other factors in that framework. This does however not mean that the participant feels fully satisfied with the application, but that the experienced a motivator that fills the role to increase satisfaction. It does also not mean dissatisfaction was

not present when they used the application, this was not measured because the nomenclature of Herzberg's Hygiene Factors are hard to transpose to a similar language that exists in the MDA-framework. It was also not measured due to the decision to exclude a reward system from the application. As the goal was to explore if Herzberg's Motivators could be applied to the MDA-framework, and in extension how motivated the participants felt when they used the system, I decided that external rewards might make the data very ambiguous, and was therefore left out. In addition to this, it would be interesting to explore in what way a reward system might affect the participants in the future. This also related to Ryan and Deci's definitions of intrinsic and extrinsic motivation (2000a), because the data I have gathered is focused upon what intrinsic motivations was experienced by the participants. Meaning that the data can suggest that the participants were intrinsically motivated to use the Detailed Feedback System, but it fails to explain if there were any extrinsic factors that might have affected them. I do however believe that some extrinsic factors might have affected the participants while they participated in the study, even if I tried to exclude as many extrinsic elements as I could.

The work I have conducted has also shown that it is important to explore how participants experience an application by the standards of different frameworks, in order to more clearly elaborate on what is experienced in a game. I do think that similar works can be conducted by analyzing other games of interest very closely, in order to find what features in a game might correlate to a certain experiences in particular environments. This may be hard to perform with games such as *Shadow of the Colossus* (2006) as Mitgutsch (2009) described as a very emotional and experience driven game. Considering that Mitgutsch found several different points that could be made concerning learning aspects from this game, and how games could benefit from this. As how experiences, emotions, learning about yourself, anticipations and prejudgments exists in *Shadow of the Colossus*, and might benefit a learning environment too, and not just focusing on logic, rational and linear learning. And as my study has shown starting to measure experiences, motivations and enjoyment with already existing frameworks could benefit the designing of serious games even more. As Mitgutsch found what kind of experiences exists in *Shadow of the Colossus* over all, an in depth analysis with a higher sample size might even find more data on what is experienced and why. As I do think it is important investigate what in such games make them emotionally driven. As previously mentioned this game may be a very good candidate to investigate or analyze, keeping in mind that it lacks a reward systems that we are quite used to when it comes to games. Which means that it may be able to elaborate further in what ways it motivates the player to continue the journey of the game, and these possible motivators can be implemented into a serious aspect in game based learning.

On a similar subject Steinkuehler and Duncan (2008) conducted a study on the scientific reasoning among the forum members in a *World of Warcraft*, as previously mentioned, and came to the conclusion that the members in fact had a scientific understanding and reasoning of what happens in the game. As in what would be the best course of action to take in order to create the most powerful character in the game, and what needs to be done in order to achieve this. Steinkuehler and Duncan stated that it may be due to the fact of the players are challenged in the game and knows that they can turn to the forum in order to discuss how to proceed. And the players also knows that the forum consists of likeminded people, considering that the users visits the forum to search for answers concerning their problems that needs to be solved in *World of Warcraft*. As in the case of Mitgutsch article, it seems that it might be very interesting to analyze this further and closer, to find in what way

these members gets motivated to seek out these discussion when they play World of Warcraft. And I think analyzing that part of the game might be very fruitful, as well as analyzing in what way it is enjoyed, and motivating. However a game such as World of Warcraft is very complex and contains a multitude of components, which means that such an analysis would be very extensive and complex itself. I do think that a start might be interviews consisting of forum members might shed some light on what they experience as enjoyment and motivation.

On the other hand Conway (2010) raised the ideas of motivating different players by different restrictions of play. As mentioned in previous chapter this about hyper-ludicity and contra-ludicity, as how different players might be engaging differently to games depending on the challenge that they present. As hyper-ludicity would be a very playful surrounding where you can do everything, while contra-ludicity is a very restrictive environment where the player has certain limitation in the resources they can play with. Conway used different kinds of game genres to explain these concepts, in order to place them in an environment and context. I do think that research like this is very useful, but I also think that it may need to apply frameworks from different fields in order to find how to measure these extremes of play, and how to apply them in combination with the MDA-framework. As the article is focused upon the differences of challenge for the player, which I do not disagree with. I do however think that there is a need to further explore in what way the player experience anything other than challenge in hyper-ludicity and contra-ludicity. Additionally, I think studies concerning hyper-ludicity and contra-ludicity may be very interesting to conduct in order to explore where the players start to become too challenged, and not challenged enough.

As Ketelhut (2007) pointed out, there were a change in students data-gathering behavior when visiting the game River-City. This is to me very interesting, because it raises questions about their motivation in the game, compared to outside of the game. As previously explained Ketelhut compared the self-efficacy of scientific inquiry skill in an ordinary classroom setting, compared to how the students self-efficacy changed during the visits to River-City where they were to exercise their scientific inquiry skill. Ketelhut found that there didn't seem to be any change in their self-efficacy in their scientific inquiry skills, but the students data-gathering behaviors had changed during their time in River-City, they had increased. As stated the article brings up questions, in what way were the students motivated when playing River-City, as well as what did they experience why? Considering that change in their behavior was found when visiting River City, comparing to how much data they gathered for each visit. Could similar change be found in what way the students were motivated in both environments, in what way they were motivated, what they experienced, as well as which environment they preferred to interact with, and why?

The articles here has as I have previously mentioned inspired me to study motivation in games, and how to measure motivation. Which is the reason why they are included in my background, and it leads me to believe that it is important to research different fields of study when measuring different aspects of motivation. And as my work has shown, it is also important to understand that even if something may be able to be measured by the means of a different framework, there seems to be a need to be able to transpose the nomenclature from other fields in order to easier communicate what is measured. The easiest example of this is Herzberg's Hygiene factors, as they indeed do are capable of measuring the factors in different areas. But when they are combined with game design where similar factors may

exist, but not exactly, it becomes increasingly harder to know what is measured and how it affects the results.

7.3 Future Work

Even though there is a significant difference between the different factors from the Herzberg's Two-Factor Theory (1968) and the MDA-framework (2004), keeping in mind that one is focused upon work satisfaction, while the other is focused upon having fun and be entertained. I do believe that it is important to further analyze different kinds of game mechanics and dynamics in order better understand how to search for appropriate mechanics and dynamics that are intended to motivate the end users in a specific way. Or how they create motivation in way that was not originally intended. It would also be interesting to try and build up a repertoire of mechanics and dynamics that have different kinds of motivational outcomes, considering the amount of papers that suggests some sort of motivational behavior in certain games. Or at least being able to document how different games may motivate people differently, and why they do this. If this was done it could be much easier to apply different kinds of mechanics and dynamics to different environments in order to satisfy some motivational need by using serious games.

I also believe that is important to try and use ways to easily classify different game like features and what kind of enjoyment they produce, and what kind of motivational factors they might produce as well. Herzberg states in "One more time" (1968) that in order to measure a change in the Motivator Factors and experiment needs to run for at least 6 months, with one control group which haven't had any alterations, and one experimental group with alterations. He also states that it is expected for the Motivator Factors to decrease in the initial satisfaction during the first three months for the experimental group considering that the changes may be confusing for the participants, but they will however start to increase in satisfaction compared to the control group afterwards. Which also have been measured in several experiments done by Herzberg, and other international studies as well. He also states what might need to be done in order to start to develop a experiment for motivational factors, this would be done by having a brainstorm meeting where the sought after factors are discussed. He strongly notes that you always should refrain from generalizations in these meetings, as just stating that Recognition is needed, because this does not answer or describes what Recognition would be in a context, it just points towards a direction. Herzberg also states that the ones in the brainstorming group should listen to the affected groups, but they should not be a part of the meeting. The reason for this is that being a part of the meeting might give them a sense of artificial motivation. This is something that might be very important when trying to define why and how a gamification feature is motivating, there will be a initial result in the different factors, but it is important to keep track of how these different factors may increase and decrease over time in the different implementations. As in Herzberg's example, the first initial months in the experimental group showed a significant decrease in motivation when they did not understand the new implementations, but it did however far exceed the control group in the end. This is something that needs to be expected.

As the focus in this paper has been kept on intrinsic motivation, I think it may be fruitful to explore in what way a game environment extrinsically motivates the user than just challenge and flow. This could be done by trying to transfer the nomenclature of Herzberg's Hygiene factors in order to make them more relatable in a game environment. The reason why this

would be interesting is that it does not ask the same question whether or not something is motivating, but rather what in the environment is experienced to be dissatisfactory, and what is not dissatisfactory. As it is important to distinguish between what it means to be satisfied and not dissatisfied, the latter allows for improvement, while the former does not. Which would ask the participant what exists in the game environment which makes them dissatisfied, and does not make them as dissatisfied?

It would also be of interest to continue to evaluate the Detailed Feedback System in different kinds of environment. Knowing that this implementation results in scores high in Sensation, considering the visual impact of photography for the participant. It would be fruitful to implement the system in environments where there are no considerable visual feedbacks for the participants. An example would be how it would fare in a text-based environment, such as a story writing circle, or programming, where the participants can evaluate what is good about the given text. Keeping in mind what kind of motivational factors became significant in this experiment when the participant were to evaluate something, in this case, photos. As well as conducting similar experiments where Keller's ARCS-model (Keller, 1984) are in place as well, where it might be possible to explore in what way the participants motivation is changed during the experiment depending on what kind of information is given to the participant. As Keller's ARCS-model (ARCS is an acronym of Attention, Relevance, Confidence, Satisfaction) is based upon presenting information in order to gain attention, as well as keeping the information relevant to the situation, and letting the information explain what is expected, as well as what positive outcomes comes from the information or instruction. I do believe that this could be done with several experimental groups, as well as control groups in order to find measurable data. In order to further analyze motivation and how the environment affects motivation from a game, it would be interesting to include Maslow's Hierarchy of Needs (Maslow, 1943), where he explains that in order to reach certain a threshold where motivation can start to take place, certain needs has to be fulfilled. Very much like how Herzberg (1968) explains how the environment needs to be suited in a way in order for an employee to not feel dissatisfied. Maslow's Hierarchy of Needs could in this case be used as an extra mean of measurement that can position a participant on how well the environment is suited in order for motivation to take place.

Much of the research that I have presented has shown that games are motivating in a variety of ways, which leads me to believe that it might be important to keep track of in what way these games are motivating and be able to analyze them further, or dissect them. I also believe it is important to use these different components in different environments in order learn in what ways they behave, and to apply them to a real situation. As Herzberg (1968) states, in working environment there is always a need for how to motivate the employees, and considering that gamification seems to be quite popular to implement. It might be very good to have resources for motivational tools.

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Appendix A - Survey questions and answers

How old are you?

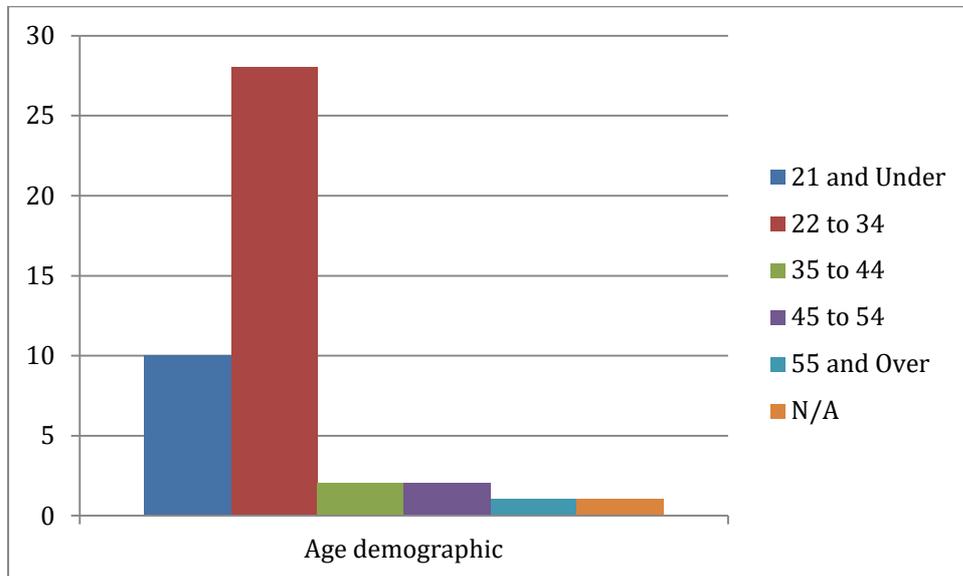


Figure 17 The age demographic of the participants.

What kind of photographer are you? (Optional, 44 respondents)

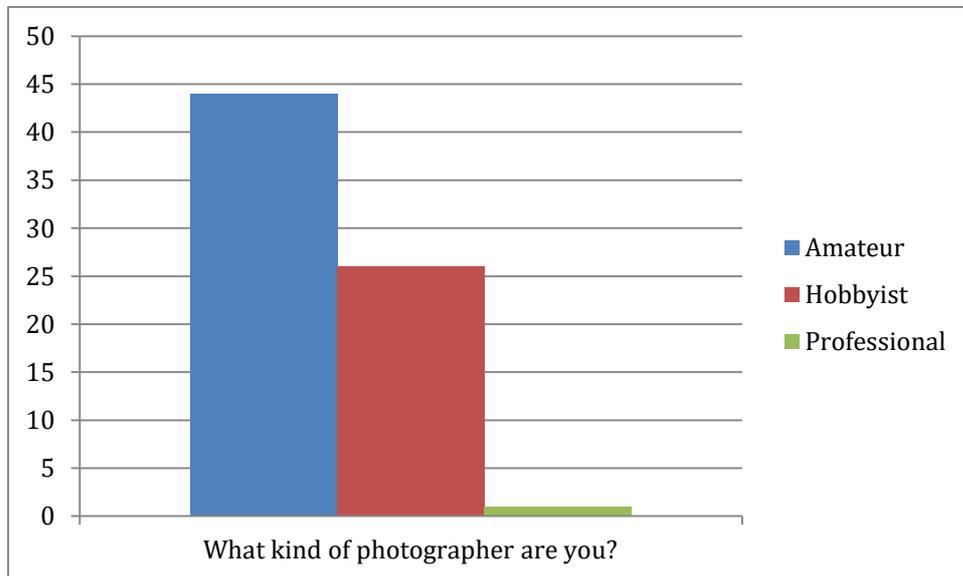


Figure 18 The participants own evaluation of what kind of photographer they are.

How much time did you need to rate the photos with the Detailed Feedback?

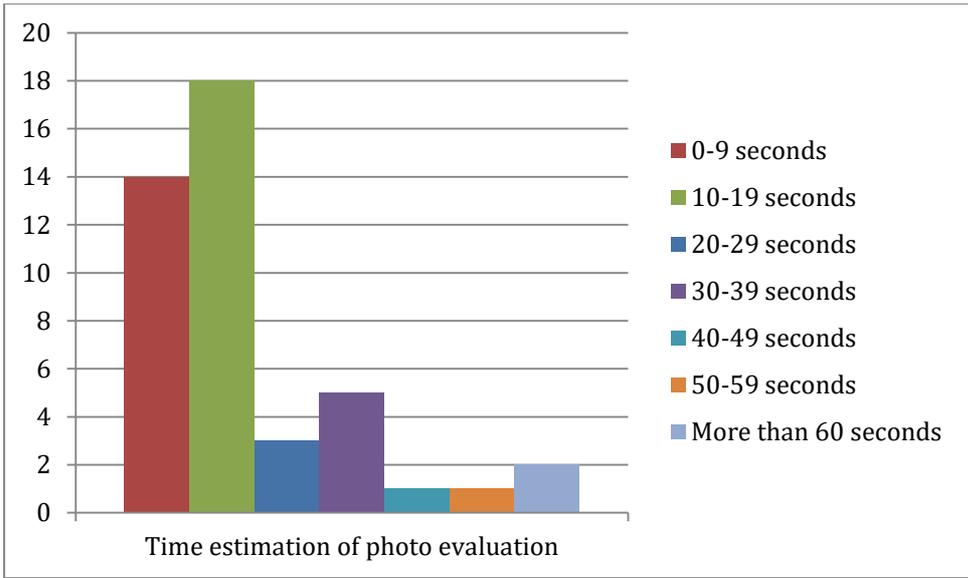


Figure 19 The estimated time each participant had to choose.

I consider myself to be good at photography.

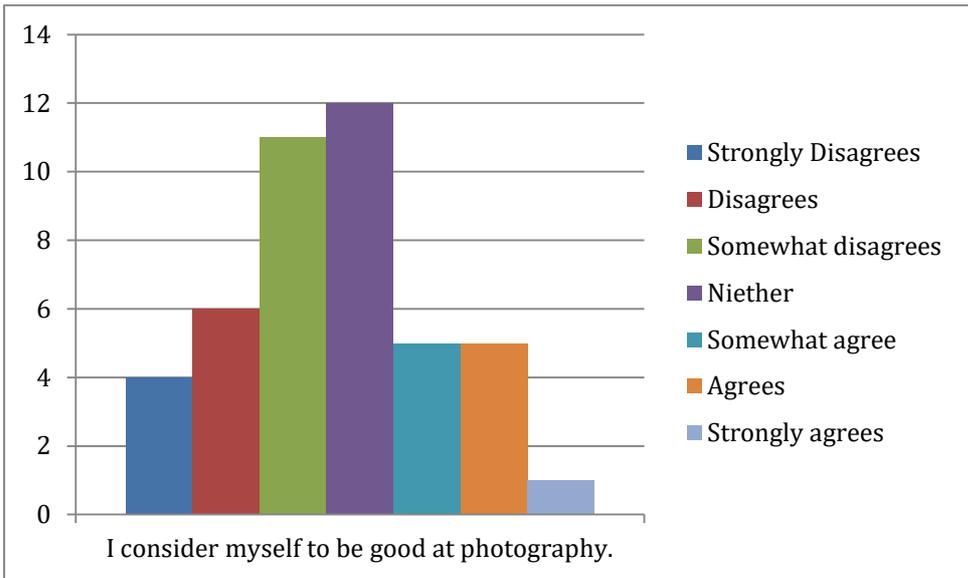


Figure 20 The participants idea of if they are good at photography.

I enjoy reviewing other people's photos using the Detailed Feedback.

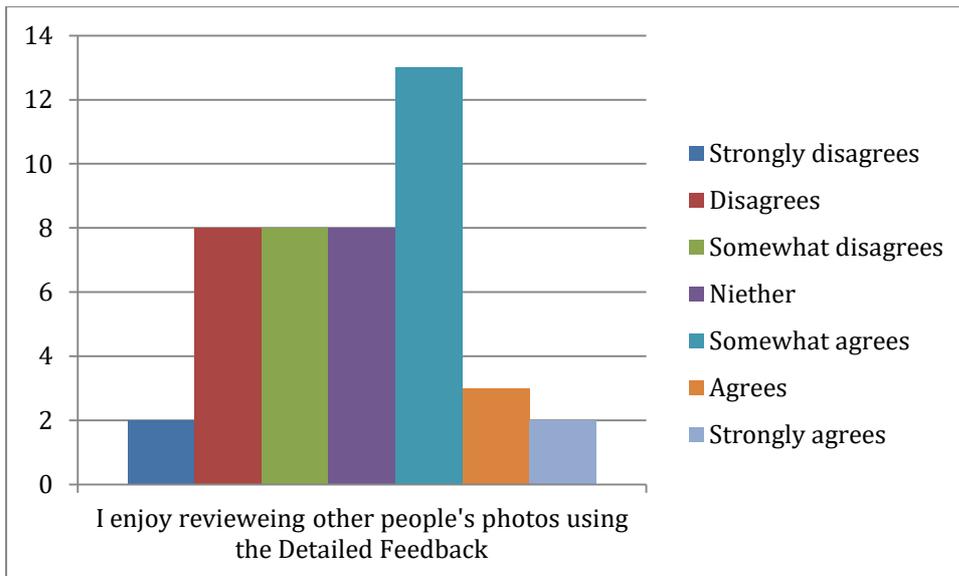


Figure 21 How the participant enjoyed reviewing the photos.

I believe that using the Detailed Feedback is of some value to me.

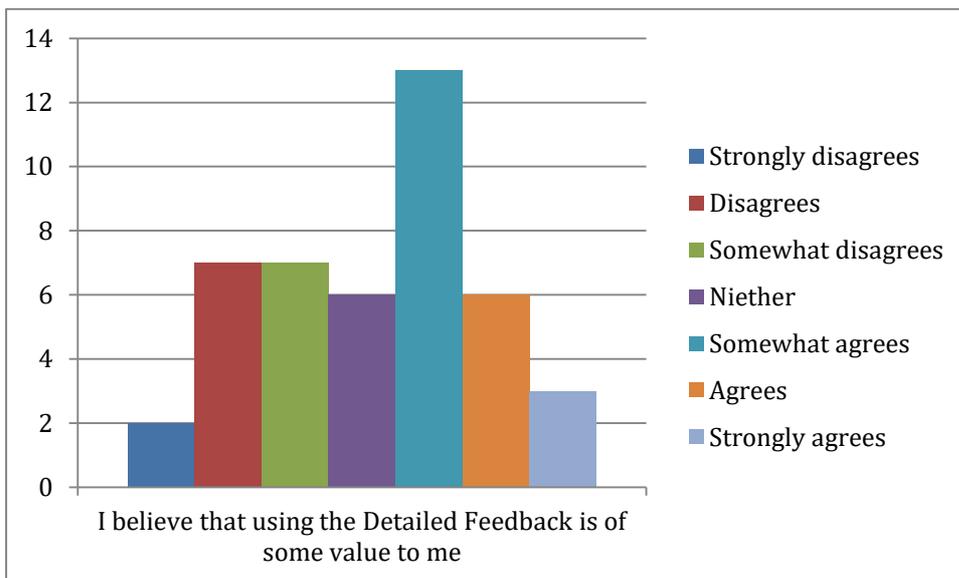


Figure 22 The participants idea of the value of the Detailed Feedback.

I would be willing to use the Detailed Feedback again because it has some value to me.

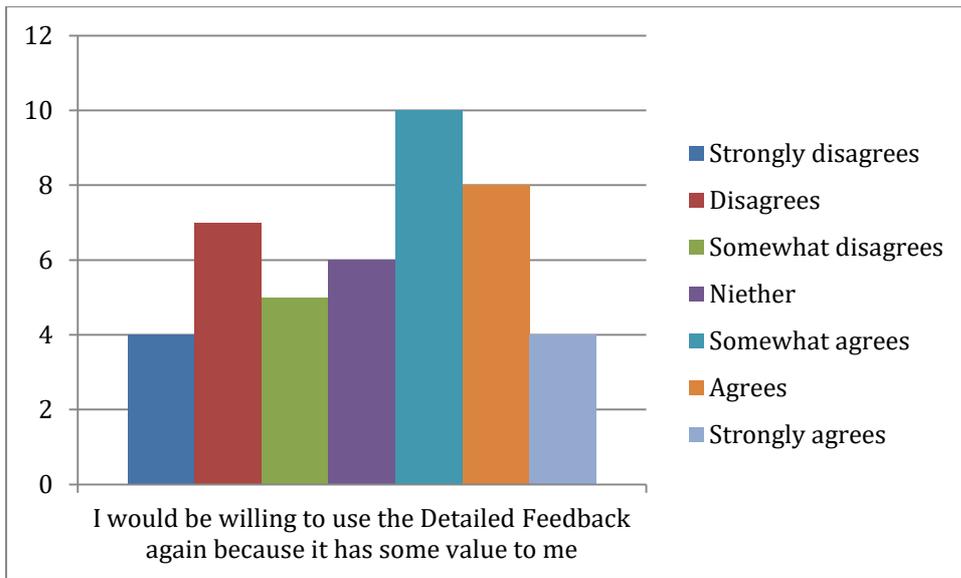


Figure 23 The participants willingness to use the Detailed Feedback again

I believe that I can learn something about photography by reviewing others photos with the Detailed Feedback.

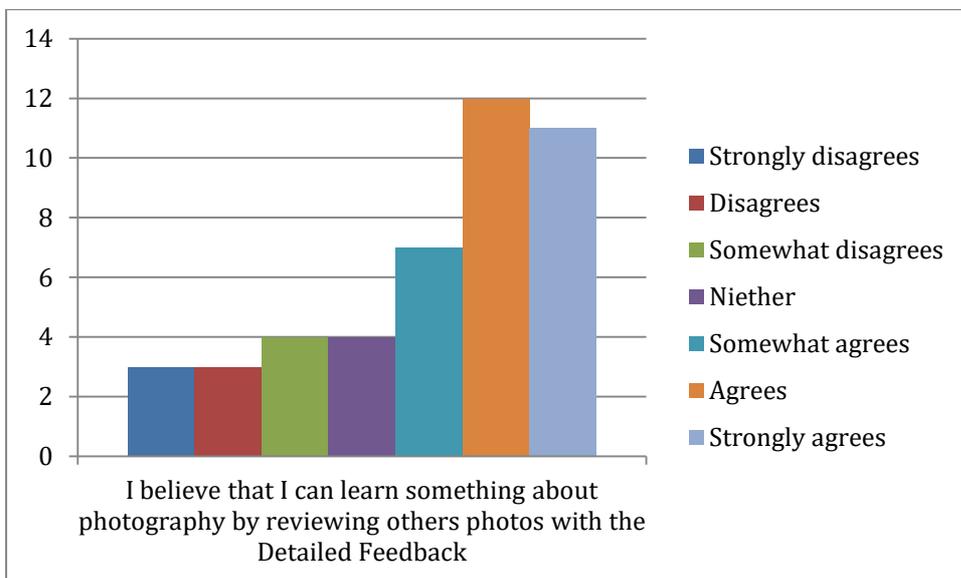


Figure 24 The participants belief if they could learn from using the system.

I believe that it was easy to understand how to use the Detailed Feedback.

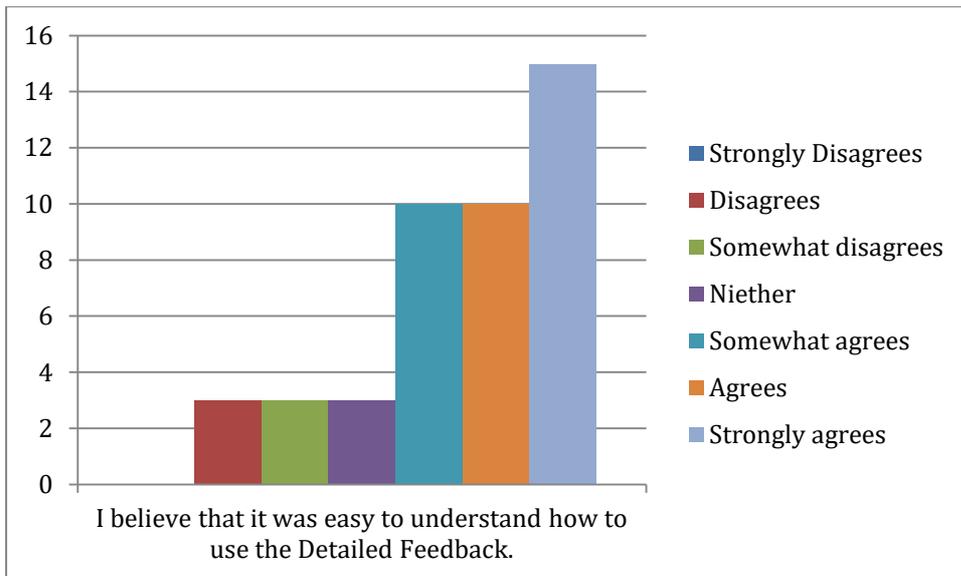


Figure 25 How easy it was to understand the system

I would like to receive feedback about what needs to be improved in my photos.

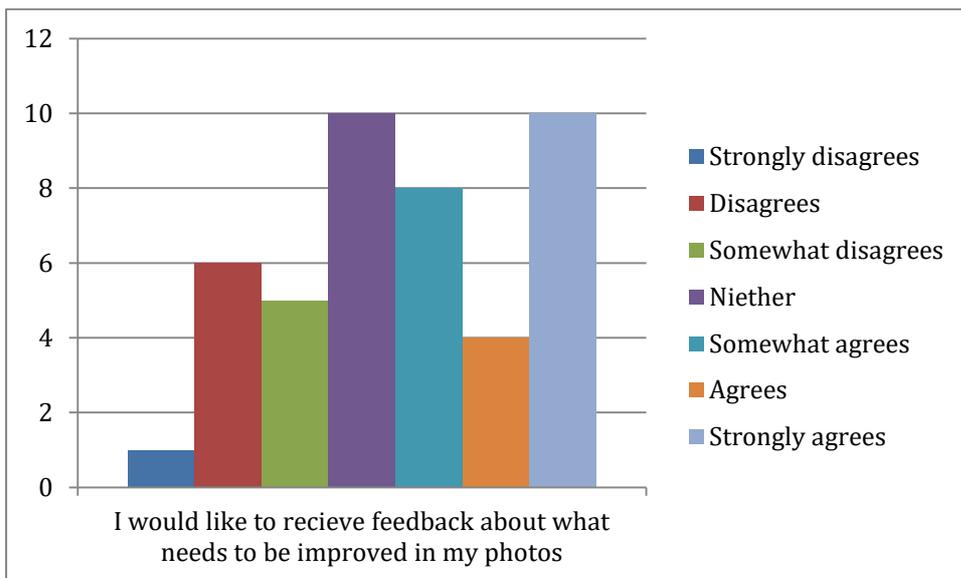


Figure 26 Whether or not the participants wanted to receive improving feedback for their own photos

Here are questions and answers regarding Herzberg's Motivators.

- This activity gives me a sense of achievement and a feeling of accomplishing something.
- This activity is challenging in a way that keeps it interesting.
- This activity gives me a sense of growth which seems to be beneficial for themselves in the field.
- This activity gives me freedom to use my own judgment which seems to give me a responsibility.
- This activity gives me a sense of recognition and praise for doing a good job.

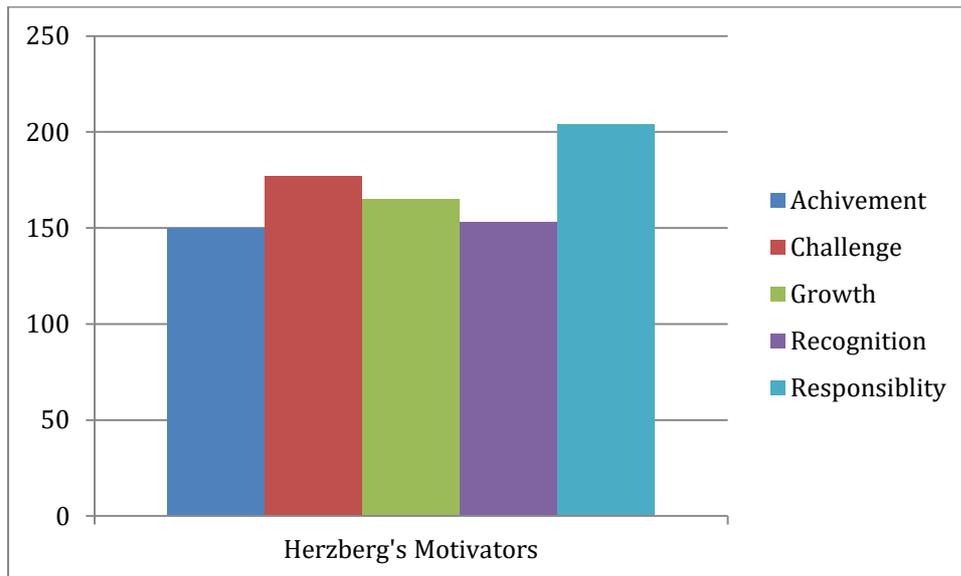


Figure 27 Data showing in what way the felt motivation when they used the feature.

Here are questions and answers regarding the MDA-framework.

- This activity gives me a sense of challenge, as trying to solve a puzzle and making hard choices.
- This activity me a sense of exploring something new, like an uncharted territory.
- This activity gives me a sense of expression which allows me to express me in a way that matters to me.
- This activity gives a sense of fantasy, as being a part of something make believe, like a role playing game.
- This activity gives me a sense of fellowship, as being a part of a social group that does something together.
- This activity gives me a sense of narrative, as being a part of an unfolding story.
- This activity gives me a sense of being affected by visual stimulation.
- This activity gives a sense of retention, that I really feel the need to back and do the same thing again and again.

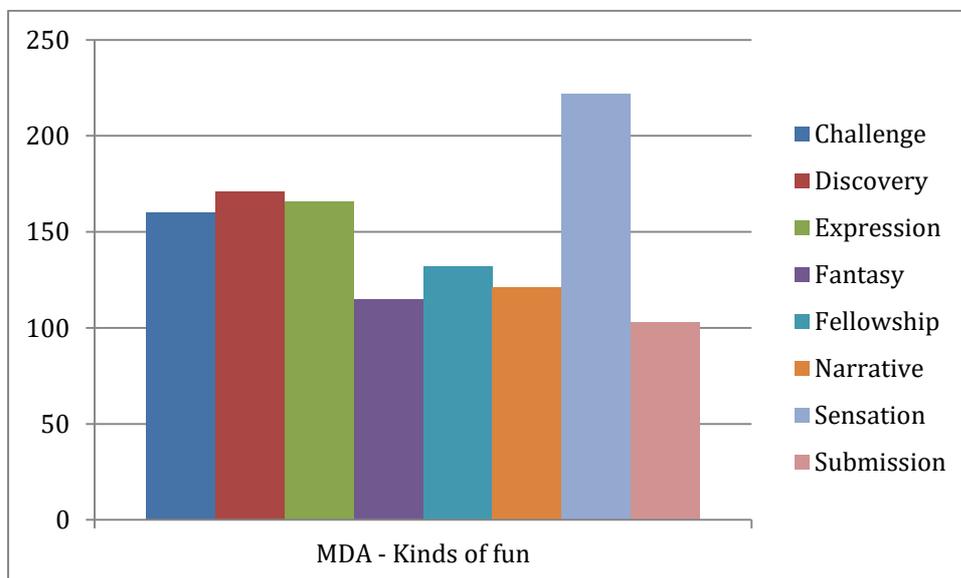


Figure 28 Data of what kind of enjoyment they felt when they using the feature.

Do you feel that the choices in the Detailed Feedback are too broad? (Optional, 42 respondents).

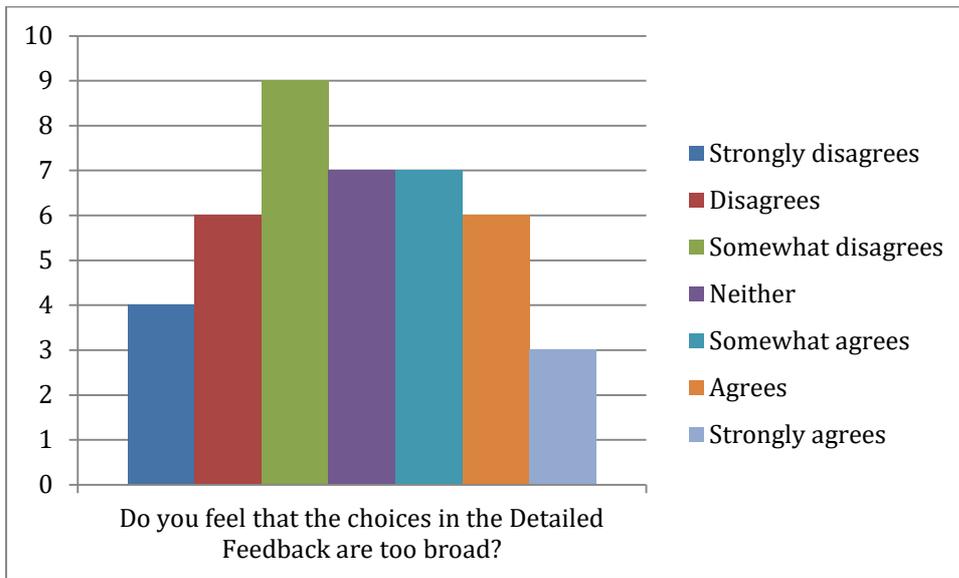


Figure 29 How much they agreed on the choices of the system were too broad.

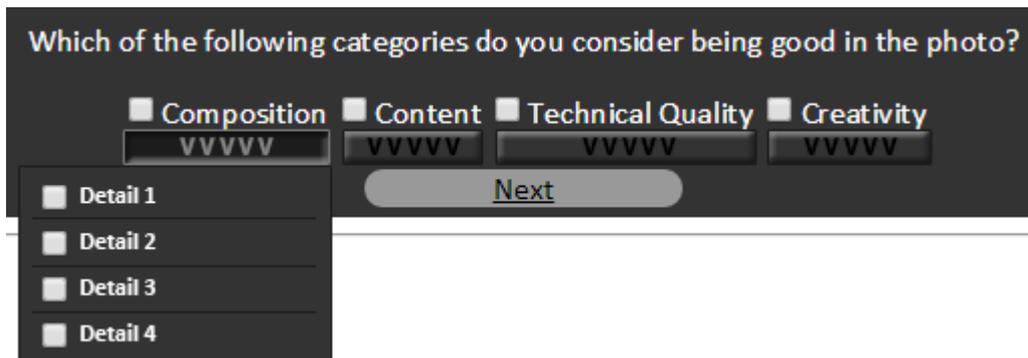


Figure 30 This picture shows a hypothetical addition to the Detailed Feedback System where the user can give more details about a category.

If you were to need more specific categories for Composition, which would they be? (Optional, 12 respondents)

- Rule of thirds, color, harmony/balance
- framing
- Pose
- Line, Shape, Colour, Texture, Tone, Form, Space, Depth
- Pose, Shutter speed, color scheme,
- Symmetry, framing, positioning, focus design
- Rule of thirds, value blocks,
- color, light,
- Position, depth
- colors

- Balance, Momentum, Appropriate to content
- color

If you were to need more specific categories for Creativity, which would they be? (Optional, 12 respondents)

- pose, depth
- Cliché, original,
- Color, Composition, Content, Technical creativity
- preparation, incubation, intimation, illumination, verification,
- Color
- pose unusuality
- combination
- Photo manipulation
- Unusual content, unsual poses, unwordly colors
- Intriguing, unexpected, spontaneous, well thought through
- Choice of target
- originality, "shocking", multi-faceted (open for multiple interpretations)

If you were to need more specific categories for Technical Quality, which would they be? (Optional, 8 respondents)

- control, demonstrations, variations
- n/a
- light
- Shutter speed, light, color
- Color, focus, sharpness, color
- shutter speed, lighting
- Photo manipulation, high res
- Focus, color, values,

If you were to need more specific categories for Content, which would they be? (Optional, 8 respondents)

- detailed, interesting, storytelling, beauty
- interesting, thought-provoking
- pose, combination, meaning
- value, criticism, narrative,
- Intresting, innovative
- Purpose, current/situational relevance, more/less essence of content
- original
- people, landscape, animals, etc

If feel that the Detailed Feedback needs choices that cover what a photographer need to get better at. (Optional, 40 respondents).

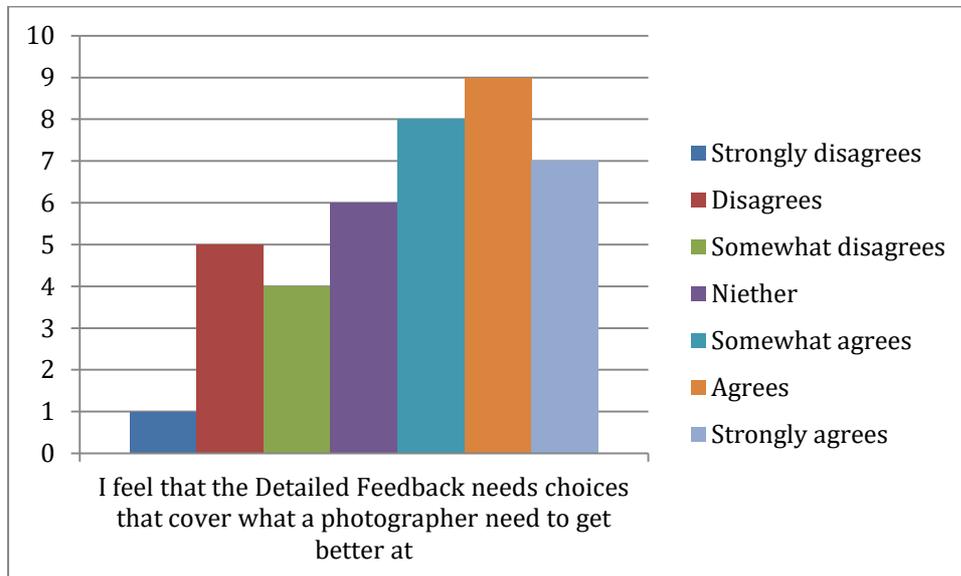


Figure 31 If they want to be able to give improving feedback.

I feel that I understand which of the colors in the picture represents the choice of what the photographer needs to improve. (Optional, 39 responded)

Which of the following categories do you consider being good or needs improvement in the photo?

Good Composition Content Technical Quality Creativity

Needs Improvement Composition Content Technical Quality Creativity

[Next](#)

Figure 32 This picture shows a hypothetical addition to the Detailed Feedback System where the user can give negative feedback to the photographer.

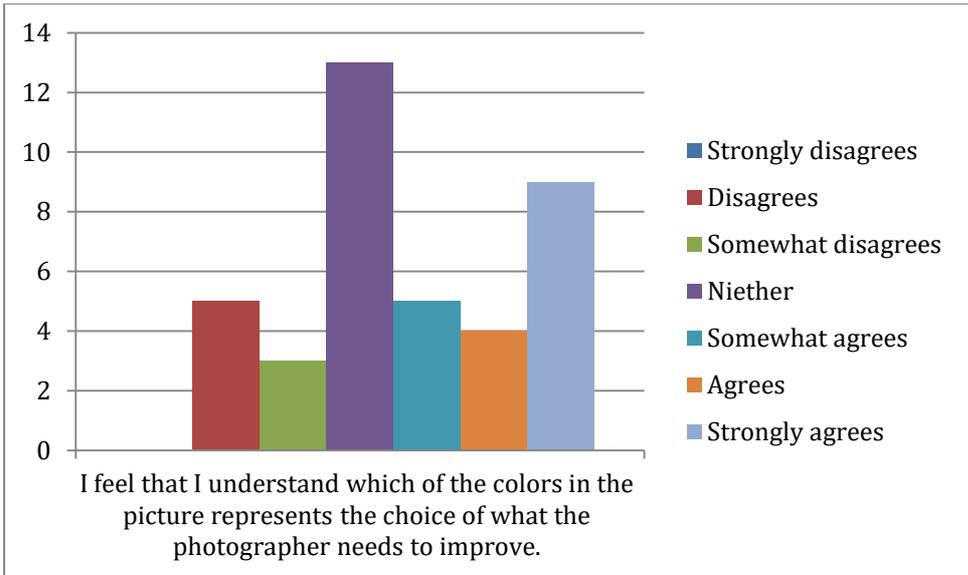


Figure 33 If they understood which colors were for positive and negative feedback.

I feel that the Detailed Feedback makes me more aware of why I like a photo. (Optional, 40 respondents)

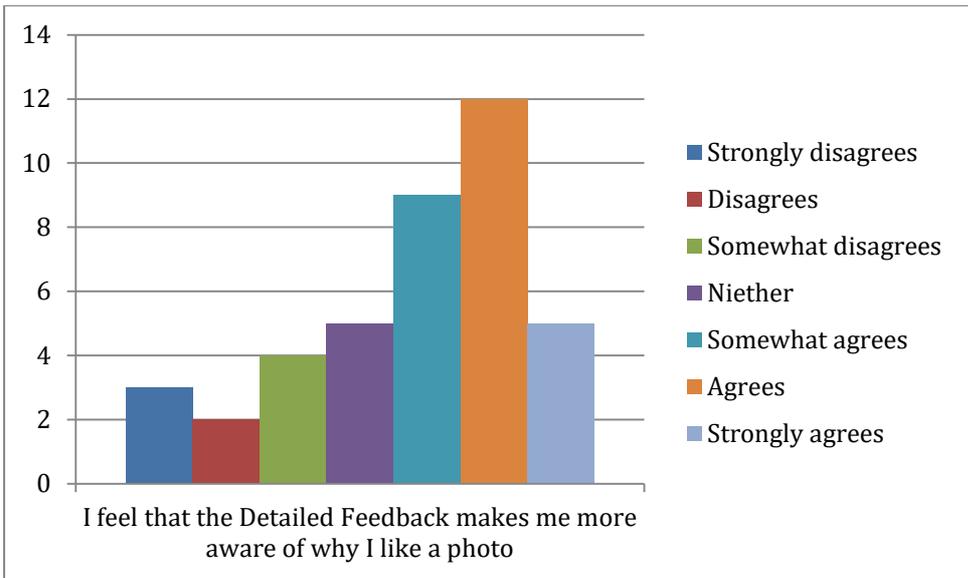


Figure 34 If they felt that the Detailed Feedback made them more aware of why they liked a photo.

Is there something you feel that is missing from the Detailed Feedback? (Optional, 8 respondents)

- Maybe an option to add other feedback or user tags.
- This is a hard question to answer, since it depends on the target audience and if it's going to be an app or website, and also I'm not the designer here so I don't know exactly where you're going with this, but I'll try to answer as well as I can.
- No, great feedback!
- Too many questions in this survey!

- More options/explanations to what is meant by eg. technical quality and perhaps a box for comments.
- An "Overall impression" category - perhaps with the expanded choices of "Idea" and "Execution" as to let the user convey an, arguably, more subjective opinion.
- When I give feedback I almost always give very concrete examples on what to work on, draw on the photo/illustration, etc. I try to show the person I'm giving feedback to where they could go from here to achieve their goal.
- Small text on hover, just to specify what the options mean. When giving a lot of feedback it is easy to get muddled by all the impressions, and something to help remember more precisely what you are responding to really helps and creates more focused feedback.